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MOWRY (H.) & CAMP (A. F.). **A preliminary report on zinc sulphate as a corrective for bronzing of Tung trees.**—*Bull. Fla agric. Exp. Sta.* 273, 34 pp., 7 figs., 1934. [Received May, 1935.]

The preliminary results are reported of experiments started in 1931 for the control of an unthrifty condition (locally known as 'bronzing') of the tung tree (*Aleurites fordii*) which of recent years has become increasingly prevalent and troublesome under certain soil conditions in Florida. The first visible symptom of the trouble is a bronze discoloration of a few or many leaves, coupled with a deformation of the terminal ones which may be very slight or extremely severe; progressively the foliage acquires a typical dark bronze colour and parts of the laminae die, giving the leaves a ragged appearance. The new leaves become more severely affected, being smaller and badly malformed, and the internodes are shortened, imparting a bunched appearance to the growth. During the first season the trouble may appear on one branch only, which may be badly affected before the symptoms appear on the others, but eventually the whole tree becomes involved.

Remarkable recovery of many severely affected trees was effected by applications to the soil of monohydrated zinc sulphate at the rate of $\frac{1}{4}$ to $\frac{1}{2}$ lb. per tree, or by spraying them with 5–5–50 zinc sulphate-lime mixture.

There was also clear evidence that bronzing of the tung tree is not an isolated trouble peculiar to the crop, since Satsuma oranges in a plot adjoining a badly bronzed lot of tung trees showed a consistent and severe chlorosis (frenching) [*R.A.M.*, xiv, p. 441] which responded to zinc treatment. Marked chlorosis and stunting were also observed in a row of *A. montana* sown in 1933 in a nursery along with several rows of *A. fordii* and were remedied by zinc sulphate at the rate of 1 lb. per hundred feet of row.

HAVELIK (K.). **Odumíráni Jedle.** [The dying-off of the Fir.]—*Ann. Acad. tchécosl. Agric.*, x, 1, pp. 124–128, 1935. [German summary.]

The author gives a brief account of field observations and histological studies which indicate that the serious and widespread dying-off of the silver fir [*Abies pectinata*: *R.A.M.*, vii, p. 350] which has of recent times become increasingly prevalent in central Europe, particularly in Czecho-Slovakia, Germany, and Poland, is chiefly due to the modern tendency

of creating pure stand forests clear of undergrowth. This practice is especially injurious to the fir, the cortical tissues of which are comparatively delicate and sensitive to sun scorch, particularly after frost. He considers that this tree should only be grown mixed with broad-leaved species, preferably beeches, and should never be planted on southern slopes or in sites exposed to direct sunshine.

HUBERT (E. E.). **Observations on Tuberculina maxima, a parasite of Cronartium ribicola.**—*Phytopathology*, xxv, 2, pp. 253–261, 2 figs., 1935.

Between 1917 and 1932 the following rusts have been found to be parasitized by *Tuberculina maxima* [*R.A.M.*, xii, p. 543] in the United States: *Cronartium coleosporioides*, *C. pyriforme*, *C. cerebrum*, *C. ribicola* [ibid., x, p. 698], and *Uredinopsis mirabilis*. In 1931 the writer obtained from Germany a large supply of spores of *T. maxima* with which inoculation experiments on *C. ribicola* cankers on white pine (*Pinus strobus*) were carried out at two localities in Idaho. The results of these tests were negative, as also were most of those subsequently made in 1931–2 with British Columbian material. The few positive data secured in these experiments indicate that the fungus is capable of establishing itself and spreading to a very limited extent, but its potentialities as an agent of rust control would appear to be inconsiderable.

ROTH (C.). **Untersuchungen über den Wurzelbrand der Fichte (Picea excelsa Link).** [Studies on the root scorch of the Spruce (*Picea excelsa* Link).]—*Phytopath. Z.*, viii, 1, pp. 1–110, 2 figs., 4 diags., 34 graphs, 1935.

In this exhaustive, fully tabulated account of his observations on spruce (*Picea excelsa*) nursery root scorch in Switzerland, which are stated to cover much the same troubles as those discussed by Hartley in the United States ('Damping-off in forest nurseries', 1921), the writer follows the latter in his differentiation of three forms of the disease, i.e., germination loss and normal and late damping-off [cf. *R.A.M.*, x, p. 569].

Pure cultures of *Pythium de Baryanum* [ibid., vii, p. 685], *Fusarium bulbigenum* var. *blasticola* [ibid., xiv, p. 256], *F. moniliforme* [*Gibberella moniliformis*], and *Rhizoctonia solani* (which is considered to be the imperfect stage of *Corticium vagum* B. et C.) [ibid., xiv, p. 258] were isolated from the diseased plants. The fungi were found to be strongly influenced by environmental conditions. Of the two most virulent of the parasites concerned, *C. vagum* is more susceptible than *P. de Baryanum* to extremes of temperature, both high and low, and of acidity and alkalinity; it is also less aggressive below soil level and thus relatively unimportant as a source of germination loss. The damping-off fungi function most actively at a temperature range of 18° to 30° C., above which *C. vagum* becomes entirely innocuous though *P. de Baryanum* is still pathogenic at 33°. No appreciable damage is caused by the two species of *Fusarium* investigated except under the protracted influence of temperatures between 24° and 33°. Since the host attains its maximum development at about 33° the seedlings can only be protected to a limited extent by cultivation at temperatures above the optimum for the para-

sites. The spruce being very sensitive to alkalinity, growth at a P_H range from 4·2 to 5·0 is indicated as at once favourable to the host and adverse to its pathogens. *P. de Baryanum* and *C. vagum* both suffer from extreme moisture and excessive dryness of the soil (100 and 50 per cent., respectively, of the water-holding capacity), the result being expressed in the former by decline of growth and in the latter by diminution of virulence.

In widespread outbreaks of an unidentified *Fusarium* on five-month-old seedlings (late damping-off) in experimental plantings and nursery gardens of eastern Switzerland in 1930, a correlation was established between density of planting and infection, the incidence of which was highest in the sparsely occupied portions of the stand and lowest in the crowded ones.

A bibliography of sixty-nine titles is appended.

VAN VLOTEN (H.). **Wie wird die Rhabdoclineschütte der Douglasien verbreitet?** [How is *Rhabdocline* leaf fall of Douglas firs disseminated?] —*Forstl. Wschr. Silva*, xxiii, 3, pp. 17–18, 1935.

The writer emphasizes and amplifies his previous assertions in support of the view that the leaf fall of disease of Douglas firs [*Pseudotsuga taxifolia*] due to *Rhabdocline pseudotsugae* [*R.A.M.*, xiii, pp. 554, 607] was introduced into Holland from Germany. The question of long-distance transport of the ascospores requires further investigation, but proof has been obtained that 5·6 per cent. of the four-year-old Douglas firs (var. *caesia*) from a well-known north German forest nursery were infected by the disease on arrival in Holland in the autumn of 1934.

Briefly replying to this contention, T. Rohde (pp. 18–19) points out that England is the most likely source of long-distance infection by *R. pseudotsugae*. Further debate as to whether the disease first appeared in Germany or Holland is regarded as pointless owing to the absence of exact information concerning the latter country.

PRODAN (I.). **Diplodia pinea (Desm.) Kickx in Rumänien.** [*Diplodia pinea* (Desm.) Kickx in Rumania.]—*Bul. Inf. Grăd. bot. Cluj*, xiv (*1934*), 3–4, pp. 240–243, 4 figs., 1935.

The needles of old pine (*Pinus sylvestris* and *P. austriaca*) trees in the park of the Cluj Agricultural Academy were found by the writer, in collaboration with the late Dr. M. Brândză, to be attacked by *Diplodia pinea* [*R.A.M.*, xiv, p. 65], usually described as a saprophyte but assuming in the present case a definitely pathogenic form associated with a rather heavy needle fall. Green needles may contract infection as long as they are attached to the tree; the external symptoms consist of brown spots, darkening to black, mostly near the base. The fungus enters through the stomata and first infects the resin ducts, whence it rapidly permeates the entire leaf. The olivaceous conidia are borne on stalks longer than themselves and measure 28 to 40 by 12 to 16 μ (mostly 32 to 38 by 12 to 14 μ). Besides the leaves the tips of the branches are liable to infection and consequent shedding.

A brief note is also given on a disorder of *P. sylvestris* involving shedding of the young shoots, on which the leaves form thick tufts at the tips and turn yellow.

FRITZ (CLARA W.). **Red stain in Jack Pine. Its development in creosoted and untreated ties under service conditions.**—*Can. Lumberm.*, liv, 18, pp. 9–10, 3 figs., 1934.

An account is given of tests of the effects of red stain of jack pine [*Pinus banksiana*], due either to *Trametes pini* and accompanied in its final stage by pitting, when it is known as 'red rot', or to an unidentified fungus referred to as 'No. 2' [*R.A.M.*, xiii, p. 135], on railway sleepers in Canada. Bending and compression tests showed that although red stain did not affect the strength of the timber, advanced red rot reduced it by 15 to 25 per cent.

Newly made sleepers examined in 1926 by the Division of Timber Pathology of the Canadian Forest Products Laboratories and found to contain viable red-staining fungi were re-examined in 1933, four years after being laid on the track. Of 3,610 cultures from the heartwood of the non-creosoted sleepers only 5·8 per cent. contained *T. pini*, the same fungus developing in 5·4 per cent. of 1,559 cultures from the creosoted sleepers. Fungus No. 2 was obtained from 14·9 per cent. of the cultures from the untreated and 9·6 of those from the creosoted timber. The data obtained from these and from other sleepers removed from the track in 1931 showed that in the intervening period the activity of *T. pini* had declined in the non-creosoted sleepers while fungus No. 2 was tending to die out in all the sleepers, and the activity of secondary wood-destroying fungi had greatly increased, especially in the untreated sleepers. Although in 1926 no wood-destroying fungus other than *T. pini* had been present, in 1933 60 sleepers examined (of which 20 had been creosoted) yielded 31·1 per cent. secondary wood-destroying organisms, 29·2 per cent. in the untreated, and 1·9 per cent. in the treated sleepers. *Lenzites sepiaria* [ibid., xiii, p. 815], isolated from 31 untreated sleepers, was by far the most actively destructive agent present.

It is concluded that sleepers containing red stain or red rot in amounts not sufficient to cause undue weakening at the outset may be accepted for use on railways.

THOMAS (A. V.). **Wood preservation.**—*Malay. Forester*, iii, 3, pp. 119–125, 1934.

A general account is given of the methods of treatment in current use in Malaya for the preservation of timber against fungal, insect, and mechanical damage, with special reference to the economic aspects of the process. *Koompassia malaccensis* and *Dipterocarpus* spp., constituting together nearly 25 per cent. of the commercial trees in the country, have both proved amenable to impregnation and a number of other timbers are undergoing experimental treatment at the Timber Research Laboratories, Sentul, mostly with a half-and-half mixture of Diesel fuel oil and creosote, 6 to 7 lb. per cu. ft., though thanalith [*R.A.M.*, xi, p. 85] is also on trial. Based on present prices, the estimated total cost of impregnation by pressure in Malaya is 80 cents [about 1s. 10d.] per sleeper [cf. next abstract].

THOMAS (A.V.). **The possibilities of open tank impregnation of Kempas and other timbers in Malaya.**—*Malay. Forester*, iv, 1, pp. 42–46, 1935.

Further tests on the preservation of *Koompassia malaccensis* in

Malaya [see preceding abstract] are stated to have shown fairly conclusively that an absorption of 7 lb. per cu. ft. of a 50–50 creosote and Diesel fuel oil mixture is adequate for the purpose. Notes are given on the plant required for the open tank treatment and on the method of carrying out the latter. Based on the present cost of creosote at 40 to 44 cents and Diesel fuel oil at 18 cents per gall., the treatment of one sleeper will require about 44 to 46 cents' worth of preservative, to which must be added the operating costs, inclusive of labour, of some 20 cents.

WORONIN (M.). **Plasmodiophora brassicae the cause of Cabbage hernia. Translated from the German into English by C. Chupp.**—*Phytopath. Class.* 4, 32 pp., 6 pl., 1934. [Received March, 1935.]

This very attractively produced booklet contains a carefully prepared translation of Woronin's communication on his discovery of *Plasmodiophora brassicae* as the cause of club root of crucifers, which was published in *Jb. wiss. Bot.*, xi, pp. 548–574, 1878, and which in its turn was an exact translation of his original paper published privately in 1877 in Russian. It also includes a brief biography of Woronin, based chiefly on two obituary notices which appeared in 1903 and 1905, and excellent reproductions of the plates illustrating the original Russian publication, which are still remarkably clear in spite of having been reduced to approximately two-thirds the size of the originals.

MOTTE (M. H.). **Le Plasmodiophora brassicae.** [*Plasmodiophora brassicae.*] —*J. Agric. prat., Paris*, N.S., xcix, 4, pp. 93–94, 1935.

It has been ascertained that, in the Grignon district of France, the spores of *Plasmodiophora brassicae*, the agent of club root of crucifers, are scarcely ever found at a depth exceeding 20 cm. in light and 10 to 20 cm. in heavy soils. A simple means of combating the disease in the seed-bed, therefore, consists in the removal, six to eight weeks before sowing, of the upper soil layer to a depth of 25 cm., thorough working of the deeper strata, and the application of an artificial manure to avoid the risk of introducing infection with stable manure. Field infection may be tested by planting with the preceding crop a small number of the highly susceptible long (Hammer) swede plants.

WALKER (J. C.) & BLANK (L. M.). **Fusarium-resistant Danish Ballhead Cabbage.**—*J. agric. Res.*, xlix, 11, pp. 983–989, 1 pl., 1934.

A brief account is given of the method by which the authors developed from commercial seed of the Danish Ballhead cabbage a homozygous strain (3331B) which in severe greenhouse and field tests in 1932 and 1933 was shown to be entirely immune from cabbage yellows (*Fusarium conglutinans*) even at an average soil temperature of 22° C., at which Wisconsin Hollander [*R.A.M.*, xiii, p. 343] showed a high percentage of the disease. This strain is now being increased for commercial use and will be designated hereafter as Wisconsin Ballhead. It is claimed to combine entire resistance to yellows with the desirable commercial properties of the standard Danish Ballhead.

CHUPP (C.). **Macrosporium and Colletotrichum rots of Turnip roots.**—*Phytopathology*, xxv, 2, pp. 269–274, 2 figs., 1935.

Macrosporium herculeum (*Alternaria*) [*A. brassicae*: *R.A.M.*, xiv, p. 140] and *Colletotrichum higginsianum* [ibid., xii, p. 546], hitherto known as leaf parasites of crucifers, have been found to cause serious root rots of turnip both in the field and in storage, the former in Ohio and the latter in New York. *A. brassicae* produces circular, dark brown to black, zonate lesions, while those due to *C. higginsianum* are dirty greyish or pale tan, with an abruptly depressed, fairly regular margin affording ingress to bacteria which impart a pale to tobacco-brown colour and wet appearance to the root. *A. brassicae* is carried in or on the seed and is killed by ten minutes' immersion of the seed in water at 122° F. No evidence was obtained of the transmission of *C. higginsianum* by the seed, but it was shown to overwinter in old diseased foliage.

OSBORN (H. T.). **Incubation period of Pea mosaic in the aphid, Macrosiphum pisi.**—*Phytopathology*, xxv, 2, pp. 160–177, 2 figs., 1935.

Pea mosaic [*R.A.M.*, xiv, p. 415] was transmitted under controlled conditions from broad bean (*Vicia faba*) to garden, field, and sweet peas and crimson clover (*Trifolium incarnatum*), and back to the original host, by the pea aphid (*Macrosiphum pisi*). Diseased *V. faba* plants show an irregular, conspicuous mottling, sometimes accompanied by mild stunting, generally appearing from 6 to 14 days after inoculation. On Telephone peas the virus induces leaf wrinkling, stunting, a yellowish, later white, somewhat transparent spotting, and enations resembling those of tobacco mosaic [ibid., xii, p. 538] on the under side. Affected sweet pea leaves show a pronounced wrinkling and streaking, while in crimson clover the leaves develop small, yellowish spots and distinct enations.

The results [which are fully tabulated and discussed] of experiments on the incubation period of the virus in *M. pisi* showed that in 20 out of 23 aphid colonies allowed to feed for limited times on diseased plants before transference to healthy ones, the period ranged from not less than 9 or more than 15 to not less than 21 or more than 48 hours; in one the range was from 72 to 96 hours, while in the two kept at 80° to 90° F. it was only 4 to 10. The virus was found to be retained for considerable periods (up to 29 days) both in individual insects and in colonies.

The potato aphid (*M. gei*) also was capable of transmitting pea mosaic from diseased to healthy *V. faba* plants. No transmission was obtained with the bean aphid (*Aphis rumicis*), and with the usual mechanical methods infection proved to be very difficult to secure.

SNYDER (W. C.) & WALKER (J. C.). **Fusarium near-wilt of Pea.**—*Zbl. Bakt.*, Abt. 2, xli, 16–21, pp. 355–378, 4 figs., 1935.

A full account is given of the symptoms, etiology, and taxonomy of the 'near wilt' disease of peas in the United States [*R.A.M.*, xii, p. 609], the agent of which has been determined by the senior author as a new form (8) of *Fusarium oxysporum*, Latin and English diagnoses being furnished. The disorder known in Europe as 'St. John's disease' [ibid., xiii, p. 612] is thought to be probably identical with 'near wilt'.

F. oxysporum f. 8 was found to attack varieties completely resistant to wilt (*F. orthoceras* var. *pisi*) [ibid., xiv, p. 71], such as Bruce and Wisconsin Early Sweet, as well as those susceptible to the latter disease, e.g., Laxton's Progress, so that its potentialities as a pathogen are considerable. It is thought that the very noticeable variations [which are described] in the morphological and cultural characters of *F. oxysporum* f. 8 under certain well-defined cultural conditions may be accompanied by corresponding differences in pathogenicity. The range of conidial variation found in the strains studied from a number of different cultures from various parts of the United States, Europe (St. John's disease), and Hawaii was no greater than that obtained in monospore cultures from a single strain. Pending further studies the use of seed from disease-free fields and the usual sanitary practices (including appropriate crop rotation) are the only control measures to be recommended.

ESAU (KATHERINE). **Ontogeny of the phloem in Sugar Beets affected by the curly-top disease.**—*Amer. J. Bot.*, xxii, 2, pp. 149–163, 13 figs., 1935.

Further investigations [which are described and discussed in detail] into curly top of sugar beets [*R.A.M.*, xiii, p. 558] showed that phloem degeneration begins before the leaf is large enough to show any external symptoms. It starts in the phloem parenchyma adjacent to the sieve-tubes after one or two of these have matured in the bundle, the cells nearest the sieve-tubes first undergoing hypertrophy and then dying ('primary hypertrophy' and 'primary necrosis'). Cells more remote are stimulated to growth and division ('primary hyperplasia'). A large proportion of the hyperplastic cells undergo a series of changes characteristic of differentiating sieve-tubes: they develop slime-bodies and plastids, their nuclei and the slime-bodies disintegrate, the amount of cytoplasm is reduced, and the walls thicken. Apparently the sieve-plates fail to complete their development, as no callus forms. Companion cells may or may not be associated with the sieve-tube-like cells in the new tissue. The hyperplastic tissue is very irregular in size and cell distribution, and is so striking in appearance, large groups of thick-walled cells poor in cytoplasm and containing numerous sieve-tube plastids standing out like clear islands among other cells containing normal nuclei and cytoplasm, as readily to identify the disease in its early stages.

The new phloem produced by the cambium after infection is abnormal and consists of degenerate sieve-tubes similar to those just mentioned (though some may mature normally) as well as companion cells and phloem parenchyma. These sieve-tubes and their companion cells subsequently die and collapse ('secondary necrosis'), while the neighbouring parenchyma cells undergo secondary hypertrophy and hyperplasia, this resulting in the formation of proliferations of large thin-walled cells resembling those of an ordinary callus.

That the cells nearest the sieve-tubes are the first to die, while those more remote apparently receive a smaller dose of the virus and are still able to divide, strongly suggests that the substance initiating the

degenerative changes in curly top beets is transported in the mature sieve-tubes.

CARSNER (E.). **Results from U.S. No. 1 resistant Beet seed.**—*Facts ab. Sug.*, xxx, 2, p. 70, 1935.

At the Californian Sugar Beet Conference on 2nd December, 1934, the yield from a planting near King City of the curly top-resistant U.S. No. 1 beet was stated to amount to 13·6 tons with 20·3 per cent. sugar compared with 2·05 tons with 20·9 per cent. sugar from a susceptible variety [*R.A.M.*, xiii, p. 144]. As a result of over-grazing on the foothill cattle ranges there has been much soil erosion and sage brush [*Artemisia tridentata* Nutt., &c.] destruction, followed by an invasion of the Russian thistle [*Salsola kali*: ibid., vii, p. 137] harbouring the beet leafhopper [*Eutettix tenella*]. Further damage will be arrested by legislation, but it will be difficult to eradicate the thistles.

LE CLERG (E. L.). **Dusting and spraying experiments for the control of Sugar-Beet leaf spot in southern Minnesota.**—*Phytopathology*, xxv, 2, pp. 234–243, 1935.

A tabulated report is presented on the data obtained in two seasons' experiments (1931–2) on the efficacy of copper sulphate-lime dust (20–80) [*R.A.M.*, ix, p. 696] and Bordeaux mixture (4–4–50) in the control of leaf spot of sugar beets (*Cercospora beticola*) [ibid., xiii, p. 425] in southern Minnesota. In three tests conducted under epidemic conditions the results in the sprayed plots were slightly superior to those in the dusted, but for practical purposes it would appear that both methods of treatment are of approximately equal utility.

LEACH (L. D.). **Combating Sclerotium root rot.**—*Facts ab. Sug.*, xxx, 2, p. 70, 1935.

It was stated at the Californian Sugar Beet Conference on 2nd December, 1934, that beet plots on which ammonium sulphate or ammonia were added to the irrigation water showed less than a third of the *Sclerotium* [*? rolfsii*: *R.A.M.*, x, p. 165] root rot found in the controls. Cyanamide, worked into the soil three weeks before planting, reduced the incidence of infection by some 50 per cent.

MCKAY (R.). **Germination of resting spores of Onion mildew.**—*Nature, Lond.*, cxxxv, 3408, pp. 306–307, 1935.

In 1930 the writer collected and exposed in the open a crop of onion leaves bearing immense numbers of resting spores of *Peronospora schleideni* [*R.A.M.*, xi, p. 689]. An examination of the material after three years revealed in some cases the partial or total disappearance of the oogonium and a thinning down of the spore wall to 2 to 1 μ. After a period of four years and five months some 1 per cent. of the spores were still viable, germinating after eleven days in water in a warm room by means of a germ-tube 6 to 9 μ in diameter. The germ-tube was seen to reach a length of 960 μ and to branch. Spores partly free from the oogonium and in process of germination were of a pale straw colour; in some instances the germ-tube pushed its way out through the enveloping folds of the persistent oogonium. This is believed to be the first record of germination of the resting spores of onion mildew.

HÜLSENBERG (H.). **Zum Auftreten des Spargelrostes (Puccinia asparagi D.C.) in der Provinz Sachsen.** [On the occurrence of the Asparagus rust (*Puccinia asparagi* DC.) in the province of Saxony.]—*Obst- u. Gemüseb.*, lxxxi, 1, pp. 10–11, 1935.

An account is given of the distribution and economic importance of asparagus rust (*Puccinia asparagi*) in Saxony [*R.A.M.*, xiii, p. 677] and of the life-history of the fungus, with a discussion of direct and indirect control measures. The losses from the disease, which is stated to be most severe in the diluvial sandy soils in the north and east of the province, are estimated for the 1,000 acres under asparagus in the municipal district of Osterburg during the period 1930–3 at about M. 500,000. Promising results in the improvement of the stands have been obtained by appropriate cultural methods, supplemented by three applications of 2·5 per cent. Wacker's Bordeaux mixture with an adhesive such as collophone-potato starch emulsion, calcium caseinate, or Wacker's Haftmittel W. Three treatments should be given between 1st and 15th May, 1st and 15th June, and 1st and 15th July on one- and two-year-old plantings, and two from 15th to 31st July and 15th to 31st August on those of three and four years old. The approximate costs of the treatment per ¼ hect., based on the amount of liquid used, irrespective of wages and depreciation of the apparatus, are M. 2·38 for a one-year planting, 5·10 for a two-year, and 4·08 for those of three or four years and above.

GIGANTE (R.). **Il mosaico della Zucca.** [Mosaic of Vegetable Marrow.]—*Boll. Staz. Pat. veg. Roma*, N.S., xiv, 4, pp. 503–530, 1 pl., 11 figs., 1934. [English summary.]

In 1931 vegetable marrow plants in the vicinity of Rome were attacked by mosaic [*R.A.M.*, iv, p. 755; v, p. 523]. The affected leaves showed light green, irregularly distributed, chlorotic areas bordered by a distinct margin and generally limited by the veins. Wrinkling was sometimes present. As the leaves aged, the chlorotic areas turned yellowish-green and occasionally dried up. No symptoms appeared on the stems and leaf stalks, but the fruits showed slight irregularity of shape and most of the affected plants were small and sickly. In the chlorotic areas the leaf lamina was 100 to 130 μ thick, as compared with 130 to 150 μ for the green areas, and had almost isodiametric palisade cells with few or no chloroplasts. In both the chlorotic and green parts of diseased leaves the mesophyll cells were closely set, with much reduced intercellular spaces, and contained X-bodies appearing as small, vacuolated, sometimes granular areas near the nucleus.

The disease was experimentally transmitted to healthy vegetable marrow plants by leaf inoculations with the juice from mosaic leaves, and by means of *Aphis gossypii*; it was not transmitted by the seed.

COOK (W. R. I.) & COLLINS (W. B.). **The life-history of Olpidium majus sp. nov., with notes on Olpidium radicale Schwartz & Cook.**—*Ann. mycol., Berl.*, xxxiii, 1–2, pp. 72–78, 1 pl., 5 figs., 1935.

A detailed description, supplemented by a Latin diagnosis, is given of *Olpidium majus* n.sp., isolated from diseased cucumber roots in a greenhouse at Llandaff, Glamorganshire. Reasons are given for the

differentiation of this fungus from other species of the same genus attacking the higher plants, including the closely allied *O. radicale* [*R.A.M.*, viii, p. 247], some corrections in the measurements of which originally given are made. *O. majus* owes its name to the exceptionally large dimensions of the zoosporangia—30 to 140 by 20 to 35 μ.

WARE (W. M.). **Mushroom-growing.**—*Bull. Minist. Agric., Lond.*, 34, 54 pp., 14 pl., 1935.

This second edition of the Ministry's bulletin on mushroom growing [*R.A.M.*, xii, pp. 72] is written by W. M. Ware in collaboration with S. J. Jary and M. D. Austin, who are responsible for the section on pests. It embodies a considerable amount of new information, acquired by the senior author in the course of a recent visit to some of the chief mushroom-growing areas in the eastern United States; in addition, the earlier text has been revised and elaborated. A chronologically arranged list of eighty-six references to the literature of the subject is appended.

SANDS (W. N.). **The Padi straw Mushroom in Kedah.**—*Malay. agric. J.*, xxiii, 2, pp. 76–77, 2 figs., 1935.

Exceedingly fine specimens of the edible mushroom *Volvaria volvacea* [*R.A.M.*, xiii, p. 420; xiv, p. 286] were found in November, 1934, growing naturally on a stack of rice straw at the Experiment Station, Kedah, Malaya, many others later being found in the vicinity. The fungus appears to be indigenous and widely distributed in Kedah. Under natural conditions the fruiting bodies are produced chiefly during the local wet season (June to November), when the fungus could be cultivated commercially, as it could be also in the drier months if precautions were taken to maintain humid conditions in the beds. Past failures to grow the mushroom have been mainly due to the absence of suitable protection from sun and wind.

CHAZE (J.) & SARAZIN (A.). **Contribution à l'étude de la môle, maladie du Champignon de couche. Morphologie interne des Psalliotes parasités.** [Contribution to the study of the 'môle' disease of the edible Mushroom. Internal morphology of the parasitized *Psalliotae*.]—*C. R. Acad. Sci., Paris*, cc, 4, pp. 343–346, 1935.

Both on its host, the edible mushroom (*Psalliota*) [*campestris* and *P. arvensis*], and in culture, *Mycogone* [*perniciosa*: *R.A.M.*, xiv, p. 345], one of the agents of the destructive malady known as 'môle' in France, forms short, cylindrical, septate hyphae terminating at the apex in a chlamydospore, whereas the often associated species of *Verticillium* produces long, slender, branched hyphae ending in an elongated spore. Penetrating the interior of the mushroom, the hyphae of *M. perniciosa* elongate considerably and simultaneously produce haustorial protuberances which indent and then perforate the cells of the pseudoparenchyma of the host. These hyphae terminate in clubs, spheres, or spatules which in turn proliferate and give rise to new hyphae of variable aspect. At a very advanced stage of infection the mushrooms lose their solid consistency, the tissues turning blackish-brown. The cells of the host are crushed and disintegrated, their contents exuding in the form of brownish drops swarming with bacteria; ultimately the sporophore

collapses, emitting a fetid odour. This final stage is preceded by the formation within the cap, and more especially inside the stalk, of spore-lined pockets resulting from cellular disintegration.

The *Verticillium* hyphae appear to be localized in the hymenial lamellae of the pileus whence they rapidly emerge either at the extremity of the lamellae or at the junction between two below the cap. Without causing the striking deformations typical of *M. perniciosa*, the associated *Verticillium* is responsible for extensive disorganization of the hymenial layers which takes a great variety of forms. The basidia of affected pilei are nearly always sterile.

Ferraris (T.). **Notizie fitopatologiche. Il black della Vite in Jugoslavia.** [Phytopathological notes. Black rot of the Vine in Jugo-Slavia.]—*Riv. agric., Roma*, xxxi, 701, p. 52, 1935.

In October, 1934, grapes from Veglia, Jugo-Slavia, submitted to laboratory examination at Conegliano and also at Alba, were ascertained to be affected with black rot [*Guignardia bidwellii*]. The disease has not so far been recorded in Italy [cf. *R.A.M.*, vi, p. 639].

Du Plessis (S. J.). **Botrytis rot of Grapes, and its control during 1933–1934.**—*Fmg S. Afr.*, ix, 104, pp. 439–442, 1934.

Continuing his investigations on the control of *Botrytis* [*cinerea*] on grapes in South Africa [*R.A.M.*, xiv, p. 213, and next abstract], the writer gives some general recommendations for vineyard practices, including picking, packing, and fungicidal treatment, confirms his previous observations on the efficacy of copper sulphur (capex) and verderame sulphur dusts, and advises the testing of the following additional precautions: (1) a light spraying of the bunches immediately before wrapping with 4 per cent. formalin, or (2) fumigation with formaldehyde gas before or after packing, using 2·9 pints of a 40 per cent. formalin solution and 23 oz. potassium permanganate per 1,000 cu. ft. overnight, or double the quantity for not more than one hour.

Boyes (W. W.), Beyers (E.), & de Villiers (D. J. R.). **Preliminary experiments on the control of wastage of table Grapes.**—*Rep. Low Temp. Res. Lab., Capetown, 1933*, pp. 94–95, 1935.

In experiments conducted in 1934 at the Low Temperature Research Laboratory, Cape Town, table grapes in cold storage were submitted to the following treatments: exposure for 10 and 20 minutes to sulphur dioxide gas [*R.A.M.*, xiv, p. 422], dipping in a solution of nascent sulphur dioxide, in pentathionic acid, in formaldehyde, and in bleaching powder, and packing in woodwool sprayed with formaldehyde or acetaldehyde. The only treatment which consistently showed possibilities of effectively controlling fungal wastage was dipping in nascent sulphur dioxide; with the variety Henab Turki (the most susceptible to wastage of those tested) this was the only method which was not distinctly injurious to the fruit.

It is mentioned that the term 'wastage', as applied to stored grapes in South Africa, is usually considered to indicate wastage due to *Botrytis* [*cinerea*: see preceding abstract] and *Penicillium glaucum*.

Dufrénoy (J.) & Genevois (L.). **Développement du Cladosporium herbarum sur des Raisins à basse température.** [The development of *Cladosporium herbarum* on Grapes at a low temperature.]—*C. R. Soc. Biol. Paris*, cxviii, 7, pp. 708–710, 2 figs., 1935.

Chasselas grapes stored in France at a temperature of 0° C. with 83 per cent. relative humidity kept well for three months apart from the blackening of a small proportion (2 per cent.) by *Cladosporium herbarum*, not hitherto reported in this connexion. The development of this fungus at a low temperature range has been the subject of comment by various writers [cf. *R.A.M.*, xiii, pp. 701, 796]. At 0° the pulp of the fruit is permeated almost as far as the pips. When removed to a temperature of 17° the fungus, either on the grape lesions or in pure culture, rapidly forms conidiophores and conidia.

England and Wales: new and interesting phytopathological records for the year 1934.—*Int. Bull. Pl. Prot.*, ix, 3, pp. 53–54, 1935.

The following phytopathological records of 1934, according to official information from the Ministry of Agriculture and Fisheries, are new for England and Wales: *Wojnowicia graminis* on wheat; *Marssonina daphnes* on *Daphne mezereum* [*R.A.M.*, xiv, p. 173]; *Bacterium vignae* var. *leguminophila* on dwarf bean [*Phaseolus vulgaris*] seeds [ibid., xiv, p. 16]; *Bact. rathayi* on cock's-foot grass [*Dactylis glomerata*: see below, p. 514]; *Thielaviopsis basicola* [ibid., xiv, p. 147] on celery and *Lilium* roots; and the uredo- and teleutospore stages of *Ochropsora sorbi* Diet. (previously only found in England in its aecidial stage on *Anemone nemorosa*) on an unidentified species of *Prunus* or *Pyrus*.

Small (T.). **Report of the Mycologist.**—*Rapp. Jersey, aux Etats de 1934*, pp. 24–38, 1935.

This report contains, among others, the following items of phytopathological interest [cf. *R.A.M.*, xiii, p. 591]. Further trials showed conclusively that the development of blight (*Phytophthora infestans*) in potato tubers exported from Jersey is almost entirely due to their being dug while the disease is present on the haulms. In some seasons spraying is so effective that no further precaution is necessary, but once a satisfactory crop of tubers has formed the haulms should be removed, either at once or as soon as the first sign of blight appears.

The tomato diseases present in Jersey are listed, together with the organisms responsible for them, and it is stated that spotted wilt was observed for the first time locally in 1934, on seedlings and older plants in the greenhouse: the plants were destroyed and no further outbreak occurred. In the same season *Septoria lycopersici* was also noted for the first time on tomatoes. A serious tomato disease that has been present for several years appears soon after the plants are set in the field; the leaf veins turn black, the necrosis spreading to the entire leaf and petiole; finally, the leaf dies and falls. New growth becomes affected in turn. Later, brown to silvery-grey areas appear on the stem, and the plant becomes hard, rustling when handled. Death generally ensues before any fruit is formed. The trouble is probably due to soil factors.

The Danish swede variety Wilhemsburger was found to be very

resistant to infection by *Plasmodiophora brassicae* [ibid., xiii, pp. 140, 343].

In the section of this publication dealing with horticulture (pp. 38–51) by E. G. Ing, an annotated list is given of fruit and flower diseases observed during the period under review.

MOURASHKINSKY (K. E.). Новые болезни культурных растений Западной Сибири. [New diseases of cultivated plants in western Siberia.]—*Trans. Omsk Inst. Agric.*, i, 6, pp. 3–30, 1935. [English summary.]

The author gives brief notes on a number of diseases of cultivated ornamental and economic plants, which he considers to be new in western Siberia; he divides them roughly into two classes, namely, those recently introduced from abroad, and those that have spread from other crops or wild plants to new hosts, adding a few whose origin is very difficult or impossible to determine. To the last category belongs a disease of oats locally known as 'zakooklivanie' ['pupation'] which was first recorded in 1922 in the vicinity of Omsk [cf. *R.A.M.*, xii, p. 306], since when it has spread to the Urals in the west and to the Pacific Ocean in the east, but is not known to have penetrated into European Russia nor to have been described from any other part of the world. The macroscopic symptoms are very characteristic; the affected oat plants exhibit an abnormally prolific tillering, some plants developing as many as 50 to 60 shoots. Sometimes at the very beginning of the summer the leaves take on a reddish, later brownish, colour and lose their elasticity. In severe cases the plants do not develop beyond the tillering stage, but more usually they are only more or less severely stunted, and form secondary shoots. Affected panicles are either abnormally dense owing to a dense branching of the foreshortened rachillae, or abnormally thin owing to the reduction in the number of spikelets or to the fact that the branches remain closely adpressed to the main axis of the inflorescence; occasionally the panicles do not emerge entirely from the leaf sheaths. Other frequent symptoms are virescence of the panicles which may develop, especially on secondary stems, into green shoots [loc. cit.], the glumes then assuming the character of true leaves; abnormally numerous florets in the spikelet (up to 6 instead of 2 or 3), on long stalks; abnormal elongation of the ovaries, which protrude far out of the glumes and become green; abnormal elongation of the stamens, and total or partial sterility of the affected plants. The disease is believed to be due to a virus, and may be an example of infection of the crop from local wild Gramineae, many of which, especially in the genus *Bromus*, exhibit very similar symptoms.

The other diseases dealt with include mosaic of wheat and rye, first recorded near Omsk in 1932 and 1933, respectively; *Bacterium translucens* [ibid., viii, pp. 151, 359] on barley; smut (*Ustilago zeae*), *Basisporium gallarum* [*Nigrospora* spp.: ibid., xiii, p. 299], and *Fusarium moniliforme* [*Gibberella moniliformis*] on maize; smut (*Ustilago bromivora*) on *Bromus japonicus*; powdery mildew (*Oidium fragariae*) [*Sphaerotheca humuli*] on strawberry, and crown gall (*Bact. tumefaciens*) on apple. Safflower (*Carthamus tinctorius*), a fairly recent introduction into western Siberia, is attacked there by *Septoria carthami* [ibid., vi, p. 355],

which is believed to have been introduced with infected seeds, and by a rust which morphological studies and cross-inoculations have shown to be *Puccinia verruca*; this fungus is locally widespread on *Centaurea scabiosa* [cf. loc. cit.].

In 1934 *Daldinia concentrica* [ibid., ix, p. 142], a common local semi-saprophyte, was found frequently causing a serious stem rot of Siberian apples (*Pyrus baccata*) which had been severely injured by frost in 1929–30 in Omsk. American maple (*Acer negundo*), which is much appreciated as a shade tree in the region, suffers from a bacterial leaf spot, the causal organism of which has not yet been identified.

CONNERS (I. L.). **Fourteenth Annual Report of the Canadian Plant Disease Survey.**—viii+116 pp., 1935. [Mimeographed.]

Notes are given on the prevalence in Canada during 1934 of fungous, bacterial, virus, and physiological diseases of cereals, forage and fibre, vegetable and field, and fruit crops, forest and shade trees, and ornamental and miscellaneous plants [cf. *R.A.M.*, xiii, p. 562]. The new foot rot of oats described by Sanford in 1933 [ibid., xiii, p. 224] has been found to be due to *Colletotrichum graminicolum* [ibid., xii, p. 212], which was also observed for the first time in the country causing anthracnose of wheat. *Pythium arrhenomanes* [ibid., xiii, p. 758] was shown by Vanterpool to be capable of attacking a number of commonly cultivated grasses [a list of which is given], and is stated to be probably the chief cause of browning root rot of wheat in Canada.

Yellow leaf blotch of lucerne (*Pseudopeziza jonesii* Nannf. = *Pyrenopeziza medicaginis* Fuck.) [ibid., xii, p. 177] was definitely ascertained by Eastham to be present in British Columbia.

Another new record for Canada is mosaic on seed mangolds on Lulu Island, near Vancouver [cf. ibid., x, p. 575], and on Swiss chard [*Beta vulgaris* var. *cycla*] in Saskatchewan.

Up to 100 per cent. infection of Danish Ballhead and Golden Acre cabbage in the Fraser Valley, British Columbia, was caused by *Phoma lingam* [ibid., xiii, p. 488]; the crop was destroyed to prevent the establishment of blackleg in the Province. Cauliflowers in British Columbia and Manitoba were attacked by the black leaf spot due to *Alternaria circinans* (B. & C.) Bolle [*A. oleracea*: ibid., xiv, p. 286], which was also reported, together with the grey leaf spot (*A. herculea*) [*A. brassicae*: ibid., xiv, p. 340], on broccoli in British Columbia for the first time.

A sweet cherry disease in the Nelson district of British Columbia, characterized by foliar mottling and crinkling, often accompanied by shot hole and arrested twig growth, is suspected to be a form of mosaic [cf. ibid., x, p. 252]. A tree on which diseased scions were grafted in 1933 is reported to have shown the typical mosaic symptoms in 1934.

Colchicum autumnale was infected in Ontario by *Urocystis* [*Tuburcinia*] *colchici* [ibid., xiii, p. 596], while lilac in Nova Scotia was affected by mosaic.

Statistics relating to seed potato certification are presented in tabular form on pp. 39–40, and a large number of interesting notes and records on pathogenic organisms and physiological disturbances, other than those mentioned above, are also included in the report.

EASTHAM (J. W.). **Report of Provincial Plant Pathologist.**—*Rep. B.C. Dep. Agric. 1934*, pp. R30–R37, 1935.

In further spraying tests against apple scab [*Venturia inaequalis*] carried out in 1933 in the West Kootenay district of British Columbia an extensive trial with the ferrous sulphate, lime-sulphur, calcium arsenate (10–2½–5) mixture previously used [*R.A.M.*, xiii, p. 682] gave very encouraging results, though the cost was about double that of lime-sulphur alone. The mixture was then used at the weaker concentrations of 6–1½–3, ditto with the final application omitted, 6–1½–1, and 4–1–2, one plot being sprayed with lime-sulphur (1 in 40) alone; the applications were made on 1st and 18th May, and 5th and 22nd June, and the fruit was picked on 18th September. The [tabulated] results showed a distinct reduction in efficiency when any ingredient was reduced below the 6–1½–3 ratio, and this formula will probably be adopted throughout the area in the next season's work.

Appreciable loss was caused to sweet cherries, especially of the Bing variety, by brown rot (*Sclerotinia cinerea*) [*S. laxa*: ibid., xiii, p. 33]; the disease usually develops more slowly than that due to *S. americana* [*S. fructicola*], which is often destructive in the Fraser valley.

As infection of loganberries with 'dry berry' disease (*Haplosphaeria deformans*) [ibid., xii, p. 772] takes place in the open blossoms, and blossoming extends over a considerable period, the only feasible control consists in finding resistant strains.

Experiments at Armstrong indicated that White Odessa, Hussar, Ridit, and Oro wheats are resistant to the local physiological forms of bunt [*Tilletia caries*: ibid., xiii, p. 682].

Blossom blight of cherries, which for some years has caused serious losses in the Victoria and Saanich districts of British Columbia, is due to a fungus identified at the Oregon Agriculture College as *Monilia oreyonensis* [ibid., vii, p. 32] and considered to be distinct from *S. cinerea* [*S. laxa*]. When Montmorency, Early Richmond, Morello, and Olivet cherry trees and Peach plums were sprayed against this disease with Bordeaux mixture at different stages, the trees sprayed at the bud, bud and calyx, calyx, flowering, and flowering and calyx stages showed, respectively, 34·1, 27·1, 26·8, 16·3, and 28·7 per cent. more clean fruits than the unsprayed controls.

Summary report of progress, 1934.—*Bull. Me agric. Exp. Sta.* 377, pp. 323–426, 1 pl., 15 figs., 2 graphs, 1934.

In 1934 the Maine potato spray service, which is directed by the local Farm Bureau and assisted by the Experiment Station workers at Aroostook Farm, posted notices to all co-operating farmers informing them whenever spraying ought to be effected; timely warnings were sent out when late blight [*Phytophthora infestans*: *R.A.M.*, xii, pp. 240, 613] first appeared, together with notes on its prevalence and the occurrence of weather conditions favouring spread. The number of growers taking advantage of the service rose to 3,006 [ibid., xiii, p. 495], an increase of nearly 600 over the previous year.

Further experiments showed that Bordeaux mixture containing a high calcium percentage was markedly inferior to a dolomitic (magnesium-containing) Bordeaux mixture [ibid., xiii, p. 725] in increasing

the yield [when used mainly against late blight] of potatoes in a highly acid soil deficient in magnesium.

Aphis abbreviata did not transmit latent mosaic from Green Mountain potatoes, but took the second (and distinguishing) component of mild, leaf-rolling, and rugose mosaics and streak to a Green Mountain seedling free from latent mosaic. In some areas this aphid appeared to be more important than *Macrosiphum solanifolii* [*M. gei*] or *Myzus persicae* in the early transmission of virus diseases.

Healthy Green Mountain potatoes one row removed from mild mosaic plants became 43 per cent. diseased [ibid., xiii, p. 495], others 15 and 100 ft. away from the affected plants developing 30 and approximately 17 per cent. infection, respectively. Seed plot stock free from mild mosaic in 1933 and grown in an isolated tuber unit seed plot developed 1·7 per cent. mild mosaic in 1934, though the nearest other potatoes were several hundred feet away. Leaf roll spread less rapidly than mild mosaic, but was carried at least 200 ft. The Chippewa and Katahdin varieties [ibid., xiii, p. 591] readily contracted leaf roll in isolated plots but were resistant to mosaic. The latter variety was grown in an increase seed plot in 1933 and rogued free from all visible diseases; the foundation seed stock so obtained was distributed, and the variety is now under general cultivation locally. The more recently developed Chippewa variety was also grown in an increase seed plot in 1933, and the seed stock distributed; this variety is very popular, the demand greatly exceeding the supply.

Even under conditions very favourable to infection the so-called Rust Proof variety [ibid., xii, p. 613] is highly resistant to foliage and tuber infection with *P. infestans*.

A comparison of 368 small McIntosh apple trees mostly given the same treatment for seven consecutive years against scab [*Venturia inaequalis*: ibid., xiii, p. 496] showed that the number of blossom clusters was significantly lower in the lime-sulphur series (8·2) than in the lead arsenate (30·3), sulphur dust (29·5), or sulphur-dry-mix series (25·7).

In 1933, maize in south-eastern Maine was severely affected by bacterial wilt [*Aplanobacter stewarti*: ibid., xiv, p. 354], but in the following year there was little evidence of natural infection, which was noticeable only early in the season, the plants apparently recovering during the summer.

Adams (J. F.). **Report of the Plant Pathologist for 1934.**—*Bull. Del. Bd Agric.*, xxv, 1, pp. 3–15, 1 graph; 1935.

In connexion with the Delaware spray service it is mentioned that from 9th April to 29th May, 1934, there were ten spore discharge periods of the ascospores of the apple scab fungus [*Venturia inaequalis*]—two more than in the previous year [*R.A.M.*, xiii, p. 563]. Notes are given in popular terms on a number of well-known diseases of fruit, field and vegetable, cereal and forage crops, and ornamentals recorded in the State during the period under review, as well as on nursery inspection and regulatory work.

Seventh Biennial Report of the Director Kansas Agricultural Experiment Station for the biennium 1st July, 1932, to 30th June, 1934.—147 pp., 3 figs., 1934. [Received May, 1935.]

Among the items of phytopathological interest in this report, besides

those already noticed from other sources, the following may be mentioned. A high degree of resistance to oat smut [*Ustilago avenae*] has been shown by some Burt and Early Red Texas selections, as well as by strains within the crosses Fulghum × Markton, Richland × Fulghum, and Kanota × Markton [*R.A.M.*, xiv, p. 761].

Superphosphate and chicken manure (especially the latter) have been found helpful in the control of take-all of wheat (*Ophiobolus graminis*) [see below, p. 502]. During the last five years it has been observed that a patch of take-all, appearing in one year, will increase during the second in size and virulence, show a corresponding decrease in the third, and may not reappear in the fourth. However, if soil from the former site of a take-all patch is transferred to the greenhouse, wheat planted thereon will contract the disease under favourable moisture conditions. The disease is promoted by a combination of high soil moisture and low temperatures. The addition to take-all-free soil, inoculated with diseased plant material, of several strains of bacteria materially reduced the activity of *O. graminis* [cf. ibid., xiv, p. 157]. The fungus has been found to a depth of 20 in. below the soil surface. The so-called 'dry land' foot rot, occurring in semi-arid regions especially in early sowings of winter wheat, is characterized by variable symptoms and may be due to a number of different fungi.

Promising results in breeding wheat resistant to leaf [brown] rust [*Puccinia triticina*: ibid., xiv, p. 229], have been obtained with several selections of Kanred × Kawvale, Kawvale × Blackhull, Kawvale × Tenmarq, and Hard Federation × Kawvale. Compound crosses such as (Kanred × Fulcaster) × (Kanred × Hard Federation), (Kanred × Fulcaster) × Tenmarq, and (Kanred × Fulcaster) × Iobred continue to exhibit greater resistance than most of the simple crosses. Physiologic form 9 of the rust [ibid., xiv, p. 88] is still the most widely distributed form in the western Mississippi Valley and Great Plains area. The rust withstands winter conditions over a large part of this region, but spring infection seems to be mainly due to inoculum borne on northerly winds.

Ten minutes' immersion of potato tubers in acidified mercuric chloride solution was equally effective in the control of *Rhizoctonia* [*Corticium solani*] with 90 minutes in a non-acid one [ibid., xiii, p. 496; xiv, p. 118]. In 1932 the incidence of infection by *C. solani* on plants from healthy seed in twenty commercial fields was 32·18 per cent., compared with only 12·50 per cent. in the excessively hot and dry summer of 1933.

The best control of cherry leaf spot [*Coccomyces hiemalis*: ibid., xiv, p. 376] was given by Bordeaux or Oxo-Bordeaux [ibid., xii, p. 358], lime-sulphur and wettable sulphur causing a yellow discoloration of the foliage.

Empusa grylli [ibid., xiv, p. 234] was found destroying grasshoppers in the field in 1930 to 1932.

Botany.—*Rep. Mich. agric. Exp. Sta., 1932–1934*, pp. 17–19, [?1935].

Experiments in the control of fireblight [*Bacillus amylovorus*: *R.A.M.*, xiii, p. 707] of Bartlett pear trees conducted in Michigan during August, 1933, using Day's zinc chloride spray treatment [ibid., vii, p. 383],

completely eliminated all canker extension and twig blight up to June, 1934, though the untreated trees were badly affected by canker and twig and blossom blight. Investigations are in progress to ascertain whether the leaf-hopper *Macropsis trimaculata*, the vector of peach yellows [ibid., xiii, p. 563], may also transmit peach 'red suture' [ibid., xiv, p. 219].

Evidence was obtained that gladiolus scab [*Bacterium marginatum*: ibid., xii, p. 356; xiii, p. 168] became more abundant as the lime content of the soil increased, and that it was more prevalent in badly than in well-drained soils. A satisfactory homozygous, white-flowered strain of snapdragon [*Antirrhinum majus*] was produced, which was entirely free from rust [*Puccinia antirrhini*: ibid., xiv, p. 172]; some coloured, rust-free strains are being used in an attempt to obtain homozygous, coloured strains. The Californian-grown Ragged Robin rose, hitherto extensively employed as a stock for choice rose varieties, was proved to be infected with mosaic [ibid., xi, p. 374; xiv, p. 363].

Michigan Golden celery, besides being very resistant to yellows (*Fusarium* spp.) [ibid., xiv, p. 418], was also of good market quality. Several forms of celery mosaic occur in Michigan, where the disease was transmitted by celery aphids and cotton aphids [*Aphis gossypii*: ibid., xii, p. 136].

Selections of resistant tomato plants of different varieties resulted in the production of a strain of John Baer with only 5 to 10 per cent. wilt (*Fusarium*) [*lycopersici*], as compared with 70 to 90 per cent. in the original strain.

ASUYAMA (H.). **New diseases and pathogens reported in the year of 1934 on our cultivated plants in Japan.**—*Ann. phytopath. Soc. Japan*, iv, 3–4, pp. 191–197, 1935. [Japanese.]

Bibliographical references are given to the following new records of plant diseases and pathogens in Japan during 1934, other than those already reported in this *Review*: black leaf spot of rice (*Entyloma oryzae*, of which *Ectostroma oryzae* and *Sclerotium phyllachoroides* are stated to be synonyms) [*R.A.M.*, xiv, p. 331]; browning root rot of wheat and barley (*Pythium* sp. [ibid., xi, pp. 164, 294 and above, p. 494] and *Nematosporangium* sp.); bacterial leaf spot of lettuce (*Lactuca sativa* var. *angustana*) caused by *Bacterium lactucae* Yamamoto; black rot of Japanese pear [*Pyrus serotina*] due to *Physalospora piricola* Nose; leaf and blossom blight of loquat [*Eriobotrya japonica*] (*Entomosporium* sp. and *Botrytis* sp., respectively); fig rot (*Rhizopus nigricans*); soft rot of squash (*Choanephoroidea cucurbitae* Miyake et Ito) [cf. ibid., xiii, p. 673]; cottony leak of beans [*Phaseolus vulgaris*] caused by *Pythium* (*N.*) *aphanidermatum* [ibid., vii, p. 2; ix, p. 561]; stem and brown cankers of rose due, respectively, to *Coniothyrium fuckelii* [*Leptosphaeria coniothyrium*: ibid., xiv, p. 313] and *Diaporthe umbrina* [ibid., xiii, pp. 230, 637]; bacterial leaf spot of begonia (*Bact. begoniae* Takimoto); *Agapanthus* seedling and leaf blight (*Phytophthora parasitica*); lily blight (*P. parasitica* and *P. cactorum*) [ibid., x, pp. 83, 667]; and black culm rot of bamboo (*Colletotrichum hsienjenchang* Hino et Hidaka). In each case the common name of the disease and the journal reference to its record are given in English; the scientific name of the pathogen is also given.

Schilberszky (K.). **Beiträge zur Biologie von Pseudomonas tumefaciens.** [Contributions to the biology of *Pseudomonas tumefaciens.*] —*Z. PflKrankh.*, xlv, 3, pp. 146–159, 1 fig., 1935.

The first case of crown gall (*Bacterium tumefaciens*) on the vine in France is stated to have been observed in 1853, while the earliest American record of the disease dates from 1892. Eight types of tumour are briefly differentiated according to their dimensions and consistency on various representative hosts. The results of inoculations with an emulsion from macerated material of a large (37 by 31 mm.) gall at the base of a *Petunia hybrida* stem at the Budapest Horticultural College on *Pelargonium zonale*, *Cineraria hybrida* [Willd. = *Senecio cruentus* DC.], and *Primula obconica* were positive at the end of 76 days in the first-named test plant only [*R.A.M.*, xiii, p. 498]. The tumours thus induced on *Pelargonium zonale* were totally different from the parent gall on *Petunia hybrida*. In the former they were pale yellow, later greyish-brown, in the latter dark brown and granular. Anatomically the *Pelargonium* galls were characterized by immense numbers of parenchyma cells and in most cases by scattered vascular elements in groups of two or three. The tissues of the *Petunia* tumour contained exclusively elongated parenchyma cells, of unequal size in places.

Bact. tumefaciens is a source of economic damage chiefly on young grafted fruit trees, certain stocks being much more susceptible than others [ibid., xi, p. 47]. In Hungary pears seem to suffer more severely from the disease than apples, and of recent years infection has assumed an epidemic form (up to 90 per cent.) on the former host. B. Husz has found wild pear stocks much more susceptible than quinces. The following control measures were made compulsory by the Hungarian plant protection authorities in 1930: sterilization of the soil frame, 10 to 14 days before sowing, with 0·25 per cent. uspulun (10 l. per sq. m.); similar treatment of the soil in which the seedlings are to be transplanted (0·5 per cent.); prior to delivery half an hour's immersion of the cuttings to above the root origins in a paste of 50 kg. of sand and argillaceous earth in 100 l. water with the addition of 0·5 per cent. uspulun, bigriol, higosan [ibid., xiii, p. 278], or tillantin [cf. ibid., xiii, p. 102].

Humphrey (H. B.), Stakman (E. C.), Mains (E. B.), Johnston (C. O.), Murphy (H. C.), & Bever (W. M.). **The rusts of cereal crops.**—*Circ. U.S. Dep. Agric.* 341, 26 pp., 4 figs., 6 diags., 1935.

A semi-popular account is given of the symptoms, life-histories, physiologic specialization, epidemiology, and control of the principal rusts (*Puccinia* spp.) attacking cereals in the United States.

Asperger (K.). **Zur Frage der Überwinterung von Puccinia triticina Erikss. und Puccinia graminis Pers. in ihren Uredoformen.** [On the question of the overwintering of *Puccinia triticina* Erikss. and *Puccinia graminis* Pers. in their uredo forms.]—*Z. PflKrankh.*, xlv, 3, pp. 131–143, 2 figs., 1935.

In discussing the overwintering of brown rust of wheat (*Puccinia triticina*) in the form of uredosori in the neighbourhood of Vienna the author states that this is not likely to occur on dead plant material. In his experiments uredo material collected in July germinated only

very feebly in the following December when kept in the open under a cover [*R.A.M.*, xiii, p. 82], and by January attempts to infect wheat with the uredospores gave almost negligible results. The survival of the rust in the form of successive generations of uredospores on living wheat seedlings is, however, a possibility to be considered, especially after mild winters. By maintaining plants of the comparatively susceptible Dioszeger variety in the laboratory under conditions approximating to those obtaining in the field during the winter, it was possible to prolong the incubation periods of *P. triticina* and *P. graminis* to 44 and 45 days, respectively. It is reasonable to suppose that in nature these periods are considerably longer, so that both rusts are evidently capable of withstanding in the mycelial condition the rigorous winter climate in the locality in question. Microscopic and field examination showed that in both *P. triticina* and *P. graminis* the mycelium remained viable, with occasional uredo pustule formation in the case of the former only, until the spring, though during the latent period it did not as a rule assume an aggressively parasitic character. In the case of *P. graminis* no pustules were observed between the autumn and the early summer, so that in this rust perpetuation by means of successive generations of uredospores is excluded. The late development of this rust in the summer months indicates that overwintering in the form of latent mycelium can play little part in the initiation of the annual attack, which would appear to depend mainly or altogether on the teleutospore stage of the fungus.

MARCHIONATTO (J. B.). **Argentine Republic : yellow rust in the Wheat-growing region. Behaviour of the cultivated varieties vis-à-vis the disease.**—*Int. Bull. Pl. Prot.*, ix, 4, pp. 79–80, 1935.

Further studies were conducted under official auspices in 1934 to determine which regions of the Argentine Republic are most severely affected by the comparatively recently introduced yellow rust of wheat (*Puccinia glumarum tritici*) and the reaction of a number of standard varieties to the disease [*R.A.M.*, xi, p. 359; xiii, p. 619]. The first infections in the Buenos Aires district were observed at the beginning of the second half of September. Of 353 specimens of diseased wheat submitted for examination from seven provinces, 182 originated in Córdoba and 128 in Buenos Aires. The only variety showing a high degree of resistance to the fungus was Ardito, discarded by the Ministry of Agriculture on account of its low baking value.

SCHILCHER (E.). **Rostbekämpfung mit Kalkstickstoff.** [Rust control with calcium cyanamide.]—*Neuheiten. PflSch.*, xxviii, 2, pp. 34–36, 1935.

Negative results were given by the writer's experiments in 1933–4 at Petzenkirchen, Austria, on the control of brown rust of wheat (*Puccinia triticina*) by dusting the plants with calcium cyanamide and kaolin in the proportion of 1 : 99 [*R.A.M.*, xiii, p. 83], one to nine applications being given. The tests will be repeated, since it is thought that the calcium cyanamide concentration may have been too low for outdoor conditions, under which the comparatively robust foliage offers less likelihood of damage from the treatment than the softer leaves of greenhouse plants.

NAGAI (Y.). **Relation between brown rust of Agropyron, Puccinia agropyri Ell. et Ev. and certain plants.**—*Ann. phytopath. Soc. Japan*, iv, 3–4, pp. 121–136, 10 figs., 1935. [Japanese, with English summary.]

The results of inoculation experiments in Japan with the uredospores of *Puccinia agropyri* E. & E. from *Agropyron semicostatum* on the leaves of barley, wheat, rye, oats, and a number of common grasses are described. The germ-tubes entered the stomata of all the hosts tested as freely as those of *A. semicostatum*. On barley and rye seedlings uredosori were sometimes formed within a few days of inoculation and the spores from these sori infected further plants for several generations. Infection is also readily contracted in the field by barley and rye growing in proximity to *Agropyron*. The mesophyll cells in the diseased areas lose their turgidity, the chloroplasts shrink and become fewer, and the haustoria that have penetrated these cells appear to become inactive; haustoria in the overlying epidermal cells, however, as well as those in the parenchyma sheath, remain vigorous and functional for a longer period. A limited degree of necrosis only was produced on inoculated oats (cultivated and wild), wheat, and *Bromus japonicus*, the haustoria entering these plants becoming disorganized with the cells in which they occur and being unable to function as long or as actively as in rye or barley. On some of the other grasses there was no visible necrosis, though about three haustoria were formed by the rust hyphae after entry.

MARTINY. **Der Stand der Getreidebeizgeräte nach dem Ergebnis der Reichsnährstands-Hauptprüfung 1934.** [The status of seed-grain disinfection apparatus according to the outcome of the Reich Food Board general trial 1934.]—*Dtsch. landw. Pr.*, lxii, 10, pp. 123–124; 11, p. 135, 6 figs., 1935.

Recommendations, based on the outcome of the general trial of seed-grain disinfection apparatus by the Food Board of the German Reich in 1934, are given for the selection of the different types of machine according to individual requirements, together with technical details of construction and application and some indications of the costs of treatment [cf. *R.A.M.*, xii, p. 643 *et passim*].

PICHLER (F.). **Erprobung von Saatgutbeizmitteln im Laboratorium. I. Gegen Weizensteinbrand.** [The laboratory testing of seed-grain disinfectants. I. Against Wheat bunt.]—*Z. PflKrankh.*, xlv, 3, pp. 113–131, 1935.

Details are given of a method, originally developed by the writer (*Chem. Ztg*, xlix, 1925) and since used with success by other workers, for the evaluation in the laboratory of seed-grain disinfectants against wheat bunt [*Tilletia caries* and *T. foetens*]. In this method, the artificially contaminated and then dusted seed-grain is germinated in small vessels in finely sifted earth and the grains removed from time to time, shaken free of earth, and then examined by washing in a drop of water for spore germination. The method was subsequently slightly modified by Winkelmann [*R.A.M.*, vi, p. 281] and by the author himself. The

latter now uses finely sifted earth moistened to a degree which is determined by preliminary tests to give the maximum spore germination. The inoculated treated seed is sown in this earth in glass dishes and germination of the bunt spores tested as before from the third or fourth day, adding a little cotton blue to the water used for washing in order to show up the germ-tubes and sporidia. For the testing of liquid disinfectants the use of 0·1 per cent. calcium nitrate solution is a valuable method of determining the germination of the spores [ibid., ii, p. 555], but it requires to be supplemented by tests of germination in earth in the presence of germinating seed as in the testing of dusts. For this purpose the treated seed-grain, after taking it from the disinfectant solution, is washed on a filter to remove the disinfectant, and the spores caught in the filter tested for germination in 0·1 per cent. calcium nitrate, while the seed-grain is reinoculated with some of the spores from the filter, dried, and sown in earth as before. The effect of the disinfectant on the germinability of the seed is separately tested. In determining the chemotherapeutical index [loc. cit.] the author prefers to determine a 'relative chemotherapeutical index' against a standard preparation of mercuric chloride.

Sandu-Ville (C.). **Contribuțiuni la studiul mălurii Grâului in România.** [Contribution to the study of Wheat bunt in Rumania.]—*Anal. Inst. Cerc. agron. Român.*, vi, pp. 324–352, 2 maps, 1934. [French translation. Received June, 1935.]

The results [which are tabulated] of an examination of samples of bunted wheat ears received from 148 localities in the chief wheat-growing provinces of Rumania showed that *Tilletia foetens* predominates in the Danube valley and occurs alone in the south Bessarabian and Moldavian steppe regions. *T. tritici* [*T. caries*] occurs mainly in the hilly lands in the west of the country with a continental type of climate resembling that of central and western Europe. The local occurrence of *T. caries* in the Danubian valley (e.g., in the neighbourhood of Bucharest) is probably due to its importation with foreign selected seed wheat. Further work is in hand to determine the existence, if any, of physiological strains of the two species of bunt.

Foëx (E.). **Quelques observations sur les maladies du pied des céréales.** [Some observations on the foot rots of cereals.]—*C.R. Acad. Agric. Fr.*, xxi, 12, pp. 501–505, 1935.

The long dry spell extending practically throughout the growing period of the French wheat crops in 1933–4 was generally unfavourable to the various agents of foot rot, but in the experimental plots of the Central Station of Plant Pathology heavy damage was caused by *Cercosporella herpotrichoides*, and to a lesser extent by *Ophiobolus graminis*, which reduced the yields by 71 and 39 per cent., respectively [*R.A.M.*, xiv, p. 26]. As already reported by various workers, the wheat grown in sterilized soil from the experimental plots was more virulently attacked by *O. graminis* than that in untreated soil [ibid., xiii, p. 503]. Vernalization did not appear to reduce the incidence of infection. In a series of inoculation experiments designed to confirm and supplement those previously undertaken [ibid., xiii, p. 568], *C. herpotrichoides*

infected nine species of *Triticum*, six of *Hordeum*, and one (very slightly) of *Avena* (*A. orientalis*). *O. graminis* also attacked all species of *Triticum* and *Hordeum*, four (very slightly) of *Avena* (*A. sativa*, *A. nuda*, *A. flavescens*, and *A. elatior*), rye (very slightly), maize, *Holcus saccharinus* [sorghum], and *Setaria germanica* [*S. italica*]. Of nineteen other Gramineae used in the trials with both parasites, only *Bromus schraderi* Kunth [*B. unioloides* H.B. & K.] proved susceptible to infection by *O. graminis*.

Christensen (J. J.) & Stakman (E. C.). **Relation of Fusarium and Helminthosporium in Barley seed to seedling blight and yield.**—*Phytopathology*, xxv, 3, pp. 309–327, 4 figs., 1935.

This is an expanded and tabulated account of the writers' studies in Minnesota from 1932 to 1934 on the relative prevalence of *Fusarium* and *Helminthosporium* spp. in a large number of north-western barley samples grown in 1932 and 1933 and of the effect of these fungi on the succeeding crop, a preliminary note on which has already appeared [*R.A.M.*, xiii, p. 363]. *F. graminearum* [the conidial stage of *Gibberella saubinetii*] was the predominant species of *Fusarium* isolated from the diseased seed-grain, while *Helminthosporium* was mainly represented by *H. sativum* [ibid., xiv, p. 298], though many other species of each genus were detected. In 1932 *Helminthosporium* was three to four times more prevalent than *Fusarium*, and in 1933 the ratio of the former to the latter was still higher. Undetermined bacteria and fungi, however, especially *Alternaria* spp., were the chief agents of kernel discoloration. On the other hand, species of *Fusarium* and *Helminthosporium* were found to be responsible for most of the root rot, seedling blight, stunting or malformation, and coleoptile discoloration. The beneficial results of seed-grain treatment with ceresan were most conspicuous in the Velvet and Manchuria varieties and practically absent in Glabron and Minsturdi; in no case, however, can the use of disinfected material be recommended where clean, healthy seed is obtainable.

Thomas (R. C.). **A bacteriophage in relation to Stewart's disease of Corn.**—*Phytopathology*, xxv, 3, pp. 371–372, 1935.

A bacteriophage is stated to have been isolated from the roots and lower nodes of maize plants in Ohio killed by *Aplanobacter stewarti* [see above, p. 596], from badly infected seed-grain, and from the lower nodes and pith of plants that had recovered from a temporary attack of Stewart's disease. After 24 hours' incubation at 25° C., inhibition was apparent in cultures of the organism on Bacto-nutrient broth to which 7, 14, or 20 drops of a filtrate from wilted plants were added. With the enhancement of activity of the phage through repeated passages, the amount of filtrate added to new cultures was gradually reduced to 3, 5, or 7 drops, and at the 38th passage inhibition was demonstrated at a dilution of 10^{-7}. Complete sterilization of the cultures was not effected even at the point of maximum activity of the phage filtrate. On potato-dextrose agar the modifications induced included variation in, or loss of, yellow colour, increase or decrease of viscosity of growth, and reduction or loss of virulence. In a comparative test with 18 lots of commercial seed-grain, part of which was soaked prior to sowing in lysed cultures of *A. stewarti* (24 hours in an ice-box at 50° F. followed by the same

period at room temperature), and the rest left untreated, the average incidence of infection in the treated plots was 1·4 per cent. as against 18 per cent. in the controls. A bacteriophage was frequently isolated from plants showing mild symptoms or in a state of apparent recovery.

Christensen (J. J.) & Johnson (I. J.). **Field reaction of varieties and selfed lines of Corn to different collections of Ustilago zeae.**—*J. agric. Res.*, l, 1, pp. 47–57, 1935.

Continued comparative studies in 1931 and 1932 of the reaction of five standard varieties and ninety-five selfed lines of maize to infection with local and numerous other collections of smut (*Ustilago zeae*) under natural conditions in two different fields at University Farm, St. Paul, Minnesota [*R.A.M.*, xiv, p. 436] failed to reveal any significant differences in their relative responses to the various collections. The annual correlation coefficients between percentages of infection in replicates within each field with local and non-local collections, respectively, were essentially of the same magnitude as those of single replicates between the two fields. No statistically significant difference was found in the smut reactions of individual resistant lines grown in the two fields, and resistance in every case was the same to all the various collections tested; growth and environmental factors caused greater fluctuations in the infection percentages than did the different collections. It was clearly shown that lines resistant to local smut collections were resistant to collections from widely different sources. There was also clear evidence that lines of maize had a tendency to become infected at definite points (ear, sucker, and shoot), irrespective of the collection of smut used, and that the different collections did not influence the number of smut galls produced on each infected plant. There was, however, a high correlation between the number of galls per plant and percentage of smut infection. The size of smut galls was shown not to be the sole measure of resistance or susceptibility.

Tyler (L. J.) & Shumway (C. P.). **Hybridization between Sphacelotheca sorghi and Sorosporium reilianum.**—*Phytopathology*, xxv, 3, pp. 375–376, 1 fig., 1935.

Crosses have been made at the University Farm, St. Paul, Minnesota, between the covered and head smuts of sorghum (*Sphacelotheca sorghi* [*R.A.M.*, xiv, p. 439] and *Sorosporium reilianum* [ibid., xiii, p. 436], respectively). Sorghum plants were inoculated with potato-dextrose broth cultures of single lines and paired combinations, the former giving negative results while the latter, after an incubation period of 7 to 10 days, produced on two lots of plants the chlorotic flecking commonly following inoculation with sexually compatible monosporidial lines of either smut. The sori and chlamydospores formed on the test plants were intermediate in type between those of *S. reilianum* and *Sphacelotheca sorghi*. As with the latter, the sorus tissue developed chiefly from the ovaries and adjacent floral parts, but the sori were much longer and less regular; in their leathery, white peridium and the abundant floral proliferation produced they resembled those of *Sorosporium reilianum*. The hybrid chlamydospores approximated in size to those of the latter smut and were faintly echinulate. The long, slender promy-

celia somewhat resembled those of *Sphacelotheca sorghi*, as also did the relatively few slender, tapering sporidia.

ATANASOFF (D.). **Virus diseases of Citrus.**—Reprinted from *Annu. Univ. Sofia* (*Fac. Agron.*), xiii, 42 pp., 6 figs., 1935.

In a brief introduction to this paper the author states that the chief aim of its publication is to draw the attention of phytopathologists to the striking similarity between a number of citrus diseases described in literature, especially those whose nature is not yet clearly understood, and some of the better understood virus diseases of other fruit trees and woody plants [*R.A.M.*, xiv, p. 462]. From a survey of the relevant literature he concludes that the earliest record of a virus disease on citrus is Trabut's short note in 1913 on a graft-transmissible infectious chlorosis of orange observed by him [presumably in Algeria] chiefly on a Washington Navel orange from England and a Siletta orange grown from a graft cutting imported from Australia. A study by the author, in January, 1935, of a diseased condition of lemon trees, widespread in groves along the eastern coast of Sicily and considered by the local growers to be 'mal secco' (*Deuterophoma tracheiphila*) [ibid., xii, p. 565], showed it to be very similar in its symptoms [which are described in detail] to Trabut's infectious chlorosis, with which the author identifies it, as well as with citrus blight [ibid., viii, p. 305].

The rest of the paper presents arguments which the author believes tell in favour of the virus nature of several other citrus diseases, including withertip (commonly attributed to *Gloeosporium limetticolum*), little leaf [ibid., xii, p. 90], die-back or exanthema [ibid., xi, p. 105], leprosis or scaly bark [ibid., xi, p. 26], decorticosis or shell-bark, psorosis [ibid., xiii, p. 692], brown spot of Navel oranges, peteca of lemons [ibid., ix, p. 304], crinkly leaf, and ring blotch and zonate chlorosis [ibid., xiii, p. 630], which are considered to be the same disease.

The paper terminates with a bibliography of fifty-nine titles.

BAKER (R. E. D.). **Gummosis of Citrus in Trinidad. I. 'Marsh' Grapefruit on sour Orange stock. II. The causal organism.**—*Trop. Agriculture, Trin.*, xi, 9, pp. 236–239, 3 graphs, 1934; xii, 2, pp. 36–42, 4 pl., 1 graph, 1935.

In the first of these two papers a brief account is given of a preliminary survey in 1934, the results of which showed that gummosis is widespread and in many cases severe in plantations of grapefruit (mostly of the Marsh variety) on sour orange (*Citrus aurantium*) stocks in Trinidad, especially where the average height of the graft union is not over 6 in. above the soil. In six of the fields examined, in which the graft union was less than 6 in. above the ground, the disease percentage varied from 28·5 to 78, whereas in three fields with higher unions it was only from 2 to 4 per cent. Other factors predisposing to gummosis are low forking of the trees, low branches touching the ground, low planting, poor drainage, and lack of proper cultivation. A brief discussion is also given of possible control measures based on these observations.

In the second paper details are given of the author's investigations of the condition, the results of which showed that it is due to two species of *Phytophthora* which were identified at the Imperial Mycological

Institute as *P. parasitica* [*R.A.M.*, xiv, p. 301] and a strain of *P. palmivora* in the 'cacao' group [cf. ibid., xiii, p. 77]. Observations indicated that *P. parasitica* is mainly responsible for gummosis in the field, while both species are equally important in the production of brown rot of the fruit. Neither of the two was capable of rotting cacao pods even when inoculated through wounds, but *P. parasitica* readily rotted lemons and eggplant fruits. *P. citrophthora* has not been found so far in Trinidad.

Reichert (I.) & Hellinger (E[sther]). **Penicillium rot of Oranges and the conditions affecting its appearance in Palestine.**—Reprinted from *Hadar*, vi, 4, 13 pp., 6 graphs, 1933. [Received May, 1935.]

Investigations into the conditions prevailing in Palestinian orange groves conducive to *Penicillium* rots [*P. digitatum* and *P. italicum*: *R.A.M.*, xii, p. 21] showed that the susceptibility of the fruits increased with age, that infection was more prevalent on light than on heavy soils and on the upper than on the lower part of the trees, and that spraying with Bordeaux mixture in one instance considerably reduced the loss from the disease.

Parker (E. R.). **Experiments on mottle leaf by spraying with zinc compounds.**—*Calif. Citrogr.*, xx, 4, pp. 90, 106–107, 2 figs., 1935.

Full details are given of further experiments in the Moreno Valley, near Riverside, California, in the control of mottle leaf of citrus [see next abstract] by treatment with zinc compounds [*R.A.M.*, xiii, p. 692]. As a result of the trials the following recommendations are made. Severely affected trees should be given a spray consisting of 10 lb. zinc sulphate (25 per cent. zinc) and 5 lb. hydrated lime to 100 galls. water, while in moderate or mild cases a 5–2½–100 formula should suffice. Both mixtures should be supplemented by blood albumin in dry or liquid form at the rate of 4 oz. per 100 galls. as a spreader. Satisfactory results were obtained with a 'light' spray giving only one-third of the normal coverage.

Reed (H. S.) & Dufrénoy (J.). **Modification in cell structure accompanying mottle leaf of the Orange.**—*Amer. J. Bot.*, xxii, 3, pp. 311–328, 10 figs., 1935.

In this further account of their studies of the alterations in the cells of orange leaves from trees affected with the mottle leaf disease [*R.A.M.*, xiv, p. 302 and preceding abstract], the authors mention that buds on affected shoots developed more slowly than those on normal ones. The differentiation of meristematic into specific tissue cells was delayed, and even in early stages the cells produced an increased amount of phenolic compounds antagonistic to carbohydrate synthesis. The palisade cells in the leaf primordia divided normally and produced enlarged cells containing a few chloroplasts of reduced photosynthetic capacity; numerous fat globules were present in the cytoplasm and plastids. The osmotic strength of the vacuoles was apparently below normal in the palisade cells, which were rapidly penetrated by neutral red and Nile blue A; they are about twice normal width and were often divided transversely into rhomboidal cells with few, if any, chloroplasts. The vacuolar

sap was sufficiently acid (at least P_H 4) to keep iron salts in solution both in mottled and normal leaves.

STEYAERT (R. L.). **Observations sur la stigmatomycose des capsules du Cotonnier au Congo Belge.** [Observations on stigmatomycosis of Cotton bolls in the Belgian Congo.]—*Bull. agric. Congo belge*, xxv, 4, pp. 473–493, 1 graph, 1934.

A full account is given of a detailed study made to obtain statistical data as to the seasonal development of internal boll disease (stigmatomycosis) of cotton in the Belgian Congo and to determine the critical period of infection. The investigation was limited to bolls showing no outward sign of necrosis, in which infection had taken place through insect punctures.

After listing the known hosts of the fungi associated with the disease in different countries and their insect vectors, the author states that the fungus chiefly present locally was *Nematospora coryli*, *N. gossypii* being much less abundant. The former had much larger spores (37 to 48 by 2·5 to 3 μ) than the type species and resembled a strain isolated by Ashby from Cauto cotton in Jamaica [cf. *R.A.M.*, v, p. 389]. The local alternate hosts of *N. coryli* and *N. gossypii* include *Centrosema plumieri* (widely used in the Belgian Congo for shade and green manuring), *Phaseolus lunatus*, cowpea, and soy-bean. At Stanleyville the author observed *P. lunatus* infected by *N. coryli*, *N. gossypii*, and *Spermophthora gossypii*.

Three forms of internal boll rot are distinguished, viz. stigmatomycosis caused by the fungi under discussion; a red rot believed to be of bacterial origin [ibid., xiv, p. 223], producing a red discoloration of the lint and hypertrophy of the central placenta; and a condition resembling *Nematospora* infection but also, apparently, of bacterial origin. The importance of attacks of stigmatomycosis increases with increasing lateness of sowing [loc. cit.], but the other forms of internal boll rot are unaffected by seasonal factors.

LIKHITE (V. N.) & DESAI (G. H.). **Starch accumulation in stenosised Cotton plants.**—*Curr. Sci.*, iii, 8, p. 356, 1935.

Examination of cotton plants growing at Baroda and affected by stenosis or smalling [*R.A.M.*, iii, p. 272] showing that, on a dry weight basis, the leaves contained 17·5 per cent. starch, as against only 11 per cent. for healthy leaves. Starch had also accumulated in the vascular bundles of the petioles and the stems and roots, but not in the healthy branches, of diseased plants.

POISSON (R.) & PATAY (R.). **Beauveria doryphorae n.sp., muscardine parasite du Doryphore : Leptinotarsa decemlineata Say (Coleoptère chrysomélide).** [*Beauveria doryphorae* n.sp., a muscardine parasitic on the Colorado Beetle: *Leptinotarsa decemlineata* Say (a chrysomelid Coleoptera).]—*C.R. Acad. Sci., Paris*, cc, 11, pp. 961–963, 1935.

A new species of *Beauveria*, to which the name of *B. doryphorae* is given, has been observed parasitizing laboratory cultures of the Colorado beetle, *Leptinotarsa decemlineata*, in France. Infection spreads rapidly

both among imagos and nymphs and has also been induced by the artificial inoculation of eggs and young larvae with the oval conidia of the fungus (2 by 1·8 μ), which are borne on stout phialids, the two elements together forming glomerules about 30 μ in diameter. The fungus produces on Sabouraud's, blood, or beef bouillon agar dense, white, velvety colonies, assuming a chalky aspect (which is communicated to the infected insects) with the development of the fructifications. *L. decemlineata* being virtually without natural enemies, at any rate in the west of France, further attempts will be made in 1935 to propagate the new *Beauveria*.

DRECHSLER (C.). **Some non-catenulate conidial Phycomycetes preying on terricolous amoebae.**—*Mycologia*, xxvii, 2, pp. 176–205, 5 figs., 1935.

After an introductory discussion on the nature, functions, and classification of some Phycomycetes predaceous on amoebae in laboratory cultures from diseased rootlets and other vegetable refuse [*R.A.M.*, xiv, p. 360 and next abstracts], the writer gives Latin and English diagnoses of two further genera of this order, viz., *Acaulopage*, represented by five, and *Stylopage*, by three species. Some of these fungi were described summarily in 1933 [ibid., xii, p. 761] but were not named. They are considered to belong, like the recently described genus *Zoopage* and its allies, to a distinct group of the Phycomycetes, termed the Zoopagaceae. Both are characterized by a spreading mycelium and by continuous, hyaline, somewhat sparsely branching hyphae, capturing minute animals by means of yellow adhesive material, penetrating the pellicle or integument of each by a lateral branch giving rise within the host to a branched haustorium that exhausts the protoplasm; in *Acaulopage* aerial, erect hyaline conidia arise at intervals from prostrate hyphae while in *Stylopage* a single hyaline conidium is borne at the apex of an erect fertile hypha, or following repeated elongation several may be produced in succession; in both genera globose zygosporangia are formed in the substratum from the union of two similar hyphae. Attempts to isolate these fungi and grow them in pure culture have failed.

DRECHSLER (C.). **A new species of conidial Phycomycete preying on nematodes.**—*Mycologia*, xxvii, 2, pp. 206–215, 1 fig., 1935.

Latin and English diagnoses are given of *Stylopage hadra* sp.nov. [cf. preceding abstract], occurring in soil (especially leaf mould) and decaying plant refuse, capturing and consuming nematodes (*Rhabditis*, *Cephalobus*, *Diploscapter*, *Diplogaster* [*R.A.M.*, xii, p. 762], *Acrobeles*, and *Acrobeloides*) near Washington, D.C., followed by some observations on the taxonomy of the fungus.

DRECHSLER (C.). **A new Mucedinaceous fungus capturing and consuming Amoeba verrucosa.**—*Mycologia*, xxvii, 2, pp. 216–223, 1 fig., 1935.

Latin and English diagnoses are given of *Dactylella tylopaga* sp.nov., occurring in leaf mould, capturing and consuming, by means of ovoid or ellipsoid, adhesive, yellowish protuberances, *Amoeba verrucosa* near Washington, D.C. [*R.A.M.*, xii, p. 761], together with a summary of the

considerations dictating the writer's preference for the name *Dactylella* over the equivalent *Monacrosporium* [ibid., xiii, p. 509].

De Chiara (C.). **Contributo allo studio dell'etiologia del mughetto dei lattanti a Roma.** [A contribution to the study of the etiology of thrush among nursing infants in Rome.]—*G. Batt. Immun.*, xiii, 6, pp. 993–1002, 1934. [English and German summaries.]

Morphological and biochemical studies on thirteen fungal strains isolated from thrush among nursing infants in Rome indicated that eleven belonged to *Mycotorula* (*Monilia*) [*Candida*] *pinoyi* [*R.A.M.*, x, p. 790; xiv, p. 308] and two to *M.* [*C.*] *bronchialis*.

Moore (M.) & Kile (R. L.). **Pityrosporum ovalis as a causative agent of seborrheic dermatitis.**—*Science*, N.S., lxxxi, 2098, pp. 277–278, 1935.

Human patients, rabbits, and guinea-pigs reacted positively to inoculation with pure beerwort agar cultures of *Pityrosporum ovale* [*R.A.M.*, vi, p. 95; vii, p. 325] in varying proportions according to the method of infection, indicating that the organism may be a factor in the production of seborrhoeic dermatitis under favourable conditions. Previous investigators have been unable, owing to failure to cultivate the organism on artificial media, to prove the parasitism of this fungus [but see ibid., xii, p. 442].

Mackinnon (J. E.). **Estudo del primer caso uruguayo de cromoblastomicosis y 'revista critica' sobre la enfermedad.** [A study of the first Uruguayan case of chromoblastomycosis and a 'critical review' of the disease.]—*Arch. urug. Med.*, v, 2, pp. 201–226, 8 figs., 1934.

Clinical, morphological, and cultural details are given of the first Uruguayan case of chromoblastomycosis due to *Phialophora verrucosa* [*R.A.M.*, xiv, p. 100] in a white native of the country. The lesions on the patient's right hand resembled those of sporotrichosis from a histopathological point of view. The disorder described by Montpellier and Catanei from North Africa as due to *Hormodendron algeriensis* [ibid., vii, p. 639; xiv, p. 168] is considered to be a form of chromoblastomycosis, which may also be induced by *Trichosporium pedrosoi* [ibid., xiv, p. 100]. So far the known distribution of chromoblastomycosis is as follows: twenty-one cases in Brazil and one each in Paraguay and Porto Rico (*T. pedrosoi*); two in the United States and the present one in Uruguay (*P. verrucosa*); and one in North Africa (*H. algeriensis*). The disease has further been reported from Costa Rica, Russia, and East Africa (one case each) but without any definite attribution.

Lewis (G. M.). **Fluorescence of fungus colonies with filtered ultraviolet radiation (Wood's filter); an aid in determination of species: preliminary report.**—*Arch. Derm. Syph., N.Y.*, xxxi, 3, pp. 329–332, 1935.

Certain fungi growing on Sabouraud's dextrose medium (P_H 5) were found to exhibit characteristic individual fluorescent colorations when viewed in filtered ultra-violet radiation (Wood's filter), the phenomenon

being most conspicuous during the first three weeks of development in primary cultures [cf. *R.A.M.*, xii, p. 218]. The method appears to be particularly useful in the rapid differentiation of *Microsporon lanosum* and *M. audouini*, but was also applicable to other organisms, e.g., *Epidermophyton inguinale* [*E. floccosum*: ibid., xiii, p. 237], *Trichophyton interdigitale* [*T. mentagrophytes*: ibid., xiv, p. 105], *T. cerebriforme* [ibid., xiii, p. 511], and *T. gypseum* [ibid., xiii, p. 768].

WILLIAMS (J. W.). **Effect of age of a specific medium on morphology of colonies of certain pathogenic fungi.**—*Proc. Soc. exp. Biol.*, xxxii, 6, pp. 918–920, 1935.

The growth changes in a number of human pathogens planted on a peptone-dextrose-agar medium at P_H 5·6 in varying stages of ageing up to ninety days at room temperature are described. Weighing experiments covering the period of the study showed that the medium lost an average of 8·6 mg. per gm. per diem, involving a loss of 7·363 gm. water by the end of ninety days, with a consequent increase of nearly 4½ times in the concentration of ingredients. The medium may, however, safely be left for some ten weeks in the laboratory without losing any of its capacity to bring out the individual characters of a given fungus.

KITABATAKE (E.) & LIU (K. P.). **A case of pneumonomycosis aspergillina.**—*J. orient. Med.*, xxii, 3, pp. 497–505, 1 pl., 1935. [Japanese, with English abstract on p. 43.]

An undetermined species of *Aspergillus* was found to be responsible for necrosis of the lung parenchyma [cf. *R.A.M.*, xi, p. 181] in a 23-year-old male native of Manchukuo, this being apparently the first record of pneumomycosis in the region under observation or in Japan.

POLLACCI (G.). **Sopra una nuova specie di micete commensale (Phoma hominis Agostini et Tredici), isolato da forme cliniche del derma.** [On a new species of commensal fungus (*Phoma hominis* Agostini & Tredici), isolated from clinical forms of skin disease.]—Reprinted from *Atti Ist. bot. Univ. Pavia*, Ser. IV, vi, 3 pp., 1935.

After referring to various cases in which the new species *Phoma hominis* (which is being described by Agostini and Tredici) has recently been found in Italy in association with human diseases (including granuloma of the foot, dermatomycosis of the hand, ozaena, otomycosis, and subacute and vasomotor rhinitis), the author gives a brief description of some of the characters of the fungus. In culture it grows rapidly on all the usual media, forming white, flocculent colonies which later turn grey and become pink in the part adhering to the medium, finally assuming a dark brown, crusty appearance. The pycnidia develop from small yellowish-brown stromata and are brown and filled with round or elliptical, hyaline pycnospores, measuring 2·5 to 12·5 μ in diameter. There is also an *Alternaria* stage [cf. *R.A.M.*, xi, p. 374] characterized by irregularly shaped, variously septate, yellowish or brownish conidia, 5·13 to 25·6 μ long, arranged singly or in short chains.

In the clinical forms studied the fungus occurred only as a sterile, vegetative mycelium. Inoculations of laboratory animals failed to establish its pathogenicity.

JUNGHERR (E.). **Mycotic affections of the bovine reproductive system.**—*J. Amer. vet. med. Ass.*, lxxxvi, 1, pp. 64–75, 9 figs., 1935.

Clinical notes are given on some mycotic disorders of the bovine reproductive system recently observed at the Storrs (Connecticut) Agricultural Experiment Station, together with cultural and morphological details of the fungi involved, which were identified as *Aspergillus fumigatus*, *A. niger*, *Rhizopus cohnii* Berl. & de Toni, and *Mucor pusillus* [*R.A.M.*, xiii, p. 442]. The etiological significance of the infections was substantiated by the correlation between breeding and laboratory data in individual cases, but they appear to be of relatively slight importance from the standpoint of epizootic contagion in the herd. All the fungi except *A. niger* proved pathogenic to rabbits.

THOMPSON (M. A.). **The active constituents of ergot : a pharmacological and chemical study.**—*J. Amer. pharm. Ass.*, xxiv, 1, pp. 24–38; 3, pp. 185–196, 11 graphs, 1935.

An account is given of extensive pharmacological and chemical studies on the active constituents of ergot of rye [*Claviceps purpurea*: see next abstract]. The observed efficacy of the aqueous extracts of ergot must reside in some hitherto unknown, highly important active principle other than ergotoxin and ergotamin [*R.A.M.*, xiv, p. 362], since the latter are not freely extractable in water but only in alcoholic solutions. This new alkaloid has been shown by animal experiments to be closely related to the two above-mentioned constituents, from which it differs mainly in its much more soluble nature and its more prompt and powerful oxytocic action following oral administration.

The non-specific amino bases of ergot, such as histamin, tyramin, cholins, and the like, were found to contribute nothing of value to the characteristic oxytocic activity of the drug.

DUDLEY (H. W.) & MOIR (C.). **The substance responsible for the traditional clinical effect of ergot.**—*Brit. med. J.*, *1935*, 3871, pp. 520–523, 2 graphs, 1935.

In 1932 the second-named author demonstrated that liquid extract of ergot [*Claviceps purpurea*] B.P. 1914 contained a substance with a powerful action on the human uterus quite unlike that of ergotoxin and resembling that of histamin. The writers have now isolated from 10 kg. defatted ergot 0·82 gm. of a crystalline alkaloid having this clinical effect. The substance, to which the name 'ergometrine' is applied, is moderately soluble in chloroform, benzene, and dichlorethylene, very soluble in ethyl and methyl alcohols, acetone, and ethyl acetate, appreciably soluble in cold water [see preceding abstract], to which it imparts a reaction alkaline to litmus, and dissolves readily in dilute acids. It gives the dimethylamino-benzaldehyde and glyoxylic acid colour reactions common to the known alkaloids; its melting-point lies between 150° and 152° C. These properties distinguish ergometrine from all the ergot alkaloids hitherto described, including the newly discovered ergoclavin [*R.A.M.*, xiv, p. 93] and sensibamine (*Edinburgh med. J.*, xli, 1934), which partake of the nature of ergotoxin and ergotamin.

WATANABE (T.). **A new species of Ascochyta on Ramie.**—*Bull. Utsunomiya agric. Coll.*, ii, 2, pp. 27–42, 2 pl., 1935.

A tabulated account is given of the writer's morphological, physiological, and cultural studies on a serious disease of ramie (*Boehmeria nivea*) first observed at the Utsunomiya (Japan) Agricultural College in June, 1930.

Infection proceeds from the base upwards, the upper leaf surfaces developing linear, semicircular, ellipsoidal or irregular, pale green, later greyish-brown or darker spots, 2 to 40 mm. in diameter, often coalescent, and ultimately causing shrivelling and dropping of the foliage. On the petioles the lesions are fusiform or irregular and deeply sunken, causing defoliation, while those on the stems are fusiform or striate, pale yellowish-green to dark brown, conspicuously depressed, and finally involving the wilting or death of the whole plant. The most susceptible varieties are Chosen and Akouhi, followed by Hakuhi, Yamagata, Beikoku, Izu-Kairyo, and Seishin, whereas Tainan-Kokuhi is resistant and Sei, Kagisan, Kagisei, Saren, and Kōkwa moderately so.

The hyphae of the causal fungus, which is named *Ascochyta boehmeriae* Watanabe, with English and Latin diagnoses, are hyaline (later brown), and 2·2 to 6·6 μ in width on the host (2·2 to 11 μ in culture). Chlamydospores were formed in profusion on apricot and potato decoction agars. The subepidermal, later erumpent, ostiolate, gregarious or scattered, globose or subglobose, bright yellow pycnidia are 82·5 to 148·5 μ (mostly 115·5 to 132 μ) in diameter, and contain ovoidal, ellipsoidal, cocoon-shaped, straight or slightly curved, hyaline, uni- or occasionally biseptate pycnospores, 6·25 to 13·75 by 2·50 to 3·75 μ (average 7·50 by 3·75 μ). The minimum, optimum, and maximum temperatures for growth were below 5°, 25°, and 30° to 34° C., respectively. Positive results were given by inoculation experiments with spore suspensions of the fungus on *B. nivea* and a number of wild related plants, viz., *B. tricuspis* Makino, *B.* sp. (Wo-Yabumawo), *B. japonica* Miq. var. *platanifolia* Maxim., *B.* [*Villebrunea*] *frutescens* (Thunb.) Blume var. *concolor* Nakai, and *B. sieboldiana* Blume [*B. platyphylla* D. Don.], but tests on mulberries gave negative results. The incubation period of the disease ranged from 5 to 15 days. The fungus underwent no diminution of virulence as a result of six months' storage in and outdoors and in the soil.

REITER (K.). **Eine zu wenig bekannte Nelkenkrankheit.** [A too little known Carnation disease.]—*Blumen- u. PflBau ver. Gartenwelt*, xxxix, 10, pp. 118–119, 1935.

Outdoor Agadir carnations in the Lössnitz district of Saxony were extensively and severely attacked in 1934 by *Fusarium poae* [*R.A.M.*, xi, p. 737]. The organism is believed to live in a kind of symbiotic association with the mite *Pediculoides dianthophilus*, the latter conveying the spores into the interior of the flower buds and subsequently profiting by the nutritional facilities afforded by the fungal rotting. *F. poae* also occurs on meadow grasses, notably *Poa pratensis*, in company with its symbiont, producing a whitening of the panicles. The affected carnations, which showed a greyish-white rotting of the petals,

were growing on meadowland that had been dug and put into cultivation a year earlier. Obviously the fungus, which is capable of subsisting for many years in the soil, was disseminated from the grasses by the cultural operations, aggravated by the scattering of diseased refuse between the beds. *F. poae* is stated to have hitherto been known to attack only greenhouse carnations. Soil disinfection with 1 per cent. formalin is indicated.

TAYLOR (MARY R. F.). **The origin of Botrytis disease outbreaks on Lilium candidum.**—*ex* Lily Year Book 1934, London, Royal Hortic. Soc., pp. 82–89, 3 figs., 1934.

A study of the origin of outbreaks of the disease of *Lilium candidum* caused by *Botrytis elliptica* [*R.A.M.*, xiii, pp. 165, 705] showed that at 65° F. a relative atmospheric humidity of 97·7 was necessary to induce conidiophore production; at 80° an almost saturated atmosphere was required. The conidiophores protruded only when the leaf surfaces at the beginning of the experiment were moist. Under optimum conditions, the conidia emerged in seven hours, ripe spores being produced two hours later and germinating in water within a further two hours. Actual precipitation, producing a film of water on the foliage, is essential for spore formation, which occurs under optimum conditions in twelve hours. If the film remains, new leaves become infected. Spore production may continue in dry weather if the leaves remain wet, the spores retaining their viability for several months.

GREEN (D. E.). **Decay of Lily bulbs during storage.**—*ex* Lily Year Book 1934, London, Royal Hortic. Soc., pp. 79–81, 1934.

Three consignments of *Lilium longiflorum giganteum* and *L. speciosum rubrum* bulbs packed in a cement-like casing of fine earth were found on arrival in England from Japan to be almost entirely rotted, only one small consignment, packed more loosely, being in good condition. From the decayed scales a *Fusarium*, an *Aspergillus*, and eight bacteria were isolated, inoculations with which into healthy scales of *L. longiflorum giganteum* bulbs at 78° F. under dry and moist conditions gave negative results. Many affected scales yielded no organism. Of two other cases of similarly tightly packed bulbs one contained only rotted bulbs, but in the other a few sound or partially sound bulbs were found in each corner, and the others showed a less extensive decay. Many bulbs, though not rotten, were dead, and had a greyish-brown, greasy appearance.

A rough test was carried out, healthy *L. longiflorum giganteum* bulbs being placed in jars of air, and of strong carbon dioxide, respectively, sealed, and kept at 70°. In one set the atmosphere was dry, and in another, wet. The bulb in the damp carbon dioxide assumed the typical greyish-brown appearance in fourteen days, and that in the dry carbon dioxide later; the bulbs in normal air remained sound for many weeks.

It is concluded that the death of the bulbs was due primarily to the accumulation in and about them of carbon dioxide owing to the tight packing, the organisms found being present only as saprophytes.

DOWSON (W. J.) & D'OLIVEIRA (M.). **On the occurrence of Aplanobacter rathayi E. F. Smith on Dactylis glomerata in England.**—*Ann. appl. Biol.*, xxii, 1, pp. 23–26, 1 pl., 1935.

A brief description is given of a bacterial disease of cock's-foot grass (*Dactylis glomerata*) which the authors observed in 1934 in Cambridgeshire, and the general symptoms of which were a partial or complete destruction of the spikelets which were covered by a bright yellow bacterial slime. Isolations from the diseased plants yielded an organism agreeing exactly in its cultural and growth characters with *Aplanobacter* [*Bacterium*] *rathayi* [*R.A.M.*, xii, p. 571]. The disease was artificially reproduced by inoculating healthy shoots of *D. glomerata* with the naturally occurring slime from affected plants, but no infection resulted when the plants were inoculated with cultures of the organism on artificial media. This is stated to be the first definite record of *Bact. rathayi* from England, although it is believed that the disease has been present there unrecognized for some time, and that it is being constantly introduced with imported Danish seed of the grass [ibid., xii, p. 294].

RĂDULESCU (E.). **Influență atacului ruginii (Puccinia phlei-pratensis Erikss. et Henn.) la Phleum pratense.** [Effect of rust (*Puccinia phlei-pratensis* Erikss. & Henn.) attack on *Phleum pratense*.]—*Anal. Inst. Cerc. agron. Român.*, vi, pp. 314–323, 3 figs., 1 graph, 1934. [German summary. Received June, 1935.]

Observations made by the author during heavy natural epidemics of timothy (*Phleum pratense*) rust (*Puccinia phlei-pratensis*) [*R.A.M.*, ix, p. 459] in 1932 and 1933 at the Plant Breeding Station in Cluj [Klausenburg], Rumania, showed that twenty-six of the sixty strains (clones) of the grass grown in adjacent plots were highly resistant to completely immune; the yield in green substance of these strains in 1933 varied from 4·1 to 9·2 kg. per plot, as compared with yields ranging from 1 to 3·7 kg. of the susceptible clones, which were severely rusted in both years. There was also clear evidence that the rust reduced the tillering capacity of the susceptible clones, somewhat retarded their early growth in the spring, and impaired their regeneration after mowing. These results suggest the advisability of testing the rust resistance of timothy lines before adopting them for extensive sowing.

DRECHSLER (C.). **A leaf spot of Bent Grasses caused by Helminthosporium erythrospilum, n.sp.**—*Phytopathology*, xxv, 3, pp. 344–361, 7 figs., 1935.

Leaf spot of redtop (*Agrostis alba*), due to a previously unnamed species of *Helminthosporium* to which the name *H. erythrospilum* is now given, is widespread in parts of the eastern and middle-western United States [*R.A.M.*, iv, p. 418]. In wet weather the fungus causes localized, dull reddish-grey lesions. Under dry conditions discoloration is less evident, and the foliage often withers in a manner suggestive of drought injury. Seaside bent (*A. palustris*) also suffers severely from the same parasite and lesions unaccompanied by withering are caused by it on colonial bent (*A. tenuis*). *H. triseptatum* Drechsl., a less destructive pathogen than the species under discussion, produces small, pale spots

surrounded by a salmon-coloured zone on *A. alba*, and *H. giganteum* [ibid., ix, p. 39] causes zonate lesions on *A. palustris*.

H. erythrospilum forms conidia freely on maize-meal agar and other culture media. It belongs to the series of forms with ascigerous stages referable to *Pyrenophora* [ibid., xiv, p. 125] and including *H. graminеum*, *H. dictyoides* (a parasite of *Festuca elatior*) [ibid., vi, p. 272], *H. siccans* (pathogenic to *Lolium perenne* and *L. multiflorum*), and *H. avenae*, from which it was found to differ in its smaller and more closely septate conidia. From *Drechslera* (*H.*) *arundinis*, the agent of a leaf spot of *Arundo donax* in Japan [ibid., x, p. 262], the new species is distinguished by the abrupt rounding of its conidia at both ends, and by the position of the hilum within the basal segment. In pure culture the redtop fungus often produces more numerous and much smaller submerged sclerotia than those formed on artificial media by *H. bromi* [ibid., iii, p. 65] or the *Pyrenophora*, having ascospores with typically five transverse septa, that occurs in profusion on overwintered oat-straw in the Middle Atlantic States. It is characterized by erect, brown or fuliginous, simple or occasionally branched, geniculate, 1- to 10-septate conidiophores, 75 to 275 by 6 to 9 μ, bearing at successive intervals (beginning 75 to 125 μ from the base) yellowish to pale olivaceous, straight or sometimes slightly curved, subcylindrical, 2- to 10-septate conidia, abruptly rounded at the ends, 25 to 105 by 8 to 16 μ (average 65 by 12·3 μ), and individually including the non-protruding hilum within the basal contour. English and Latin diagnoses of *H. erythrospilum* are given.

PELTIER (G. L.) & TYSDAL (H. M.). **Wilt and cold resistance of self-fertilized lines of Alfalfas.**—*Res. Bull. Neb. Agric. Exp. Sta.* 76, 26 pp., 1 fig., 1 diag., 1 graph, 1934. [Received May, 1935.]

Considerable details are given of the authors' studies, started in 1928, of the reaction of a large number of inbred lines of lucerne, from plants both long cultivated in Nebraska and imported, to winter injury and to bacterial wilt (*Aplanobacter insidiosum*) [*R.A.M.*, xii, p. 636; xiv, p. 174] under controlled conditions. Preliminary tests indicated that re-inoculating lucerne stands that had survived a previous inoculation with the organism served to eliminate further susceptible individuals, the percentage of which, however, was consistently much lower in the second than in the first test. The results of the main investigation showed that selfing the lucerne lines without subjecting them to elimination through wilt infection resulted in a decrease of wilt resistance in the successive generations. Elimination of cold-susceptible seedlings by exposing them to artificially induced freezing led to a slightly increased resistance to wilt in the selfed progeny, whereas wilt elimination more definitely increased cold resistance. In both cases the result was probably due to elimination of the less vigorous plants. Elimination through wilt resulted in self-fertilized lines maintaining the resistance of highly resistant parents or in increasing the resistance of moderately resistant ones. There was clear evidence of the existence of a marked inheritance of wilt resistance, depending on more than one, possibly three factors. Some individuals were observed to exhibit high resistance to both wilt

and cold, but their progenies appeared to segregate independently for these two characters, the data so far collected indicating that more than one factor are involved in the inheritance of cold resistance.

Preliminary results of attempts at hybridization of desirable individuals indicated promising possibilities of thus building strains resistant to wilt and to cold.

EDWARDS (E. T.). **Witches' broom—a new virus disease of Lucerne.**—*J. Aust. Inst. Agric. Sci.*, i, 1, pp. 31–32, 1935.

Witches' broom of lucerne [*R.A.M.*, ix, p. 93], commonly known as 'spindle shoot', 'mistletoe', 'bunchy top', or 'kurrajong', is stated to have been known to New South Wales growers for the last twenty-five to thirty years, but only since 1931 have investigations been in progress on its origin, in which a virus is strongly suspected to be concerned. In recent tests the disease was transmitted by grafting only, negative results being obtained with mechanical inoculation, massed populations of potential insect vectors, and infected seed. The disease is characterized by marked dwarfing of the plant, a profusion of shoots from the crown, slender stems, small, erect, bunchy, abnormally rounded, chlorotic, and puckered leaves, and partial or complete absence of flowers. Seed is rarely produced. Phyllody has frequently been observed. Witches' broom is stated to be widespread throughout the extensive inland grazing areas of New South Wales, field infections of 20 to 25 per cent. being common and 60 to 70 per cent. of the plants in old stands occasionally being affected. In a two-year test under normal field conditions, the diseased plants yielded at each cutting 37·4 per cent. less weight of green fodder than healthy ones.

HIRATSUKA (N.) & TOBINA (E.). **Studies on Uromyces parasitic on Japanese species of Lespedeza and Microlespedeza.**—*Ann. phytopath. Soc. Japan*, iv, 3–4, pp. 145–171, 1935. [Japanese, with English summary.]

A tabulated account is given of the writers' experimental studies on the group of *Uromyces* forms parasitizing thirteen species of *Lespedeza* and one of *Microlespedeza* [which are listed] in Japan. It is concluded that all the rusts involved may be referred to two species, viz., the collective *U. lespedezae-procumbentis* [*R.A.M.*, vii, p. 61] on the species of *Lespedeza*, and *U. itoanus* Hiratsuka n.sp. on *M. striata* Mak. (and *M. stipulacea* Mak. in Manchuria). *U. itoanus* [a Latin diagnosis of which is given] is characterized by scattered or gregarious, minute, pale brown to cinnamon-coloured uredosori; subglobose, ellipsoidal, or obovate, echinulate uredospores, 21 to 30 by 15 to 24 μ; numerous clavate, straight or curved paraphyses, 35 to 60 by 8 to 18 μ (at the apex); minute, blackish-brown or black teleutosori; and ellipsoidal, oblong, or clavate, rarely obovate teleutospores, 27 to 48 by 12 to 24 μ, with a persistent hyaline or subhyaline pedicel up to 84 μ in length. Inoculation experiments with uredospores of *U. itoanus* gave positive results only on *M. striata*, none of the species of *Lespedeza* tested contracting infection.

Lutte contre les parasites des arbres fruitiers. Calendrier des traitements. [Campaign against fruit tree parasites. Calendar of treatments.]—*Bull. Direct. Agric. Rabat*, 10, 1 chart, 10 figs., 1935.

This is a clear representation of the official schedules of the treatment of oranges and other citrus fruits, apples and pears, peaches and almonds, and apricots and plums against insect pests and fungous diseases in Morocco. The seasons of the year and corresponding stages in the growth of the trees are shown in red and the names of the parasites and appropriate treatments in heavy black type.

Loewel (E. L.). **Die Obstbaumspritzung im Altenland.** [Fruit tree spraying in the Altenland.]—*Tech. in d. Landw.*, xvi, 3, pp. 57–59, 4 figs., 1935.

In connexion with an account of the technical aspects of spraying against insect and fungal pests in the orchards of the Altenland district of Germany, with special reference to the control of apple and pear scab (*Fusicladium*) [*Venturia inaequalis* and *V. pirina*: *R.A.M.*, xiv, p. 371], it is stated that nearly all the commercial growers are now in possession of motor-driven apparatus, which at present number about 700 in the Lower Elbe valley as against 100 to 150 six years ago. At the present time the cost of a machine of appropriate capacity is about M. 1,000 compared with M. 1,700 on the first introduction of this type of apparatus. On an average the amount (in litres) of a liquid fungicide to be applied to a tree is reckoned at slightly less than its age; 25 l. may be recommended for one of twenty to thirty years old. The average pressure of the 5 to 6 h.p. apparatus in general use is 25 to 30 atm. It is estimated that some 180 trees can be conveniently treated daily.

Hoette (Shirley). **Transport and ripening of Bananas.**—*Fruit World, Melbourne*, xxxvi, 3, pp. 133, 135, 1935.

Brief, popular notes are given on the following diseases attacking bananas during transport in Australia, viz., the black end-rot due to *Gloeosporium musarum* [*R.A.M.*, xii, p. 40; xiv, p. 427], that due to *Nigrospora musae*, stem-end rot (*Thielaviopsis* [*Ceratostomella*] *paradoxa*), squirter disease (*N. musae*) [ibid., xiii, p. 43], and a previously unrecorded *Phytophthora* rot. The last-named, which is not at present of economic importance, is characterized by a very early water-soaking and blackening of the stalk end, developing after only two days in the ripening room. Later, the blackening spreads half-way down the fruit, and a very unpleasant odour is emitted. The flesh feels soft, is grey and cheesy in appearance, and very tough in texture. The vascular strands turn purple, this colour being repeated in a central streak along the distal end of the fruit. The cells in the rotted tissue retain their starch grains intact. Experimental evidence showed that the fungus interfered with diastase activity. Further work on this disease is in progress.

Cheema (G. S.) & Dani (P. G.). **Report on the export of Mangoes to Europe in 1932 and 1933.**—*Bull. Dep. Ld Rec. Agric. Bombay* 170 of *1932* (revised 1934), 31 pp., 14 pl. (1 col.), 1935.

Particulars are given of the work connected with the export of mangoes from India to Europe in 1932 and 1933, which is discussed in rela-

tion to the following chief factors governing successful commerce in this fruit: (1) selection of suitable varieties for export; (2) correct stage of maturity at picking time; (3) right storage temperature during transit; and (4) proper methods of packing [cf. *R.A.M.*, xiii, p. 387].

Seven samples of rotted fruits from the London consignments were examined at the Imperial Mycological Institute, Kew. One showed the presence of *Gloeosporium mangiferae*, the conidial stage of *Glomerella cingulata* [ibid., xi, p. 793; xiv, p. 46]. Three were affected by a black, wrinkled rot advancing from the stem-end into the fruit; the skin was dotted with black, exposed stromata containing pycnidia with fusiform, continuous, hyaline pycnospores, 7·5 to 11 by 2·8 to 4 μ in diameter, apparently belonging to a *Phomopsis* [ibid., iii, p. 122] with A spores only. One of these fruits was simultaneously infected by a blue *Penicillium* and by *Cladosporium herbarum*. The fungus causing a firm, black, mummified type of decay in the remaining three fruits was characterized by tendrils of oval, continuous, hyaline spores, considerably larger than those of the related *Dothiorella mangiferae* Syd. Its cultural characters, including the wine-red pigmentation of the medium on Dox's agar, were suggestive of the pycnidial stage of *Botryosphaeria ribis* var. *chromogena* [ibid., ix, p. 344] (*D. ribis*), recorded on mango in Hawaii. The spores, however, were somewhat too broad for that species.

Three kinds of physiological disorders appeared to be responsible for wastage in the shipments, viz., a relatively superficial blemish in the shape of irregular, dark green, sunken, rough patches of variable size over all parts of the fruit, the texture, colour, and flavour of which were impaired; browning of the tissues surrounding the stone; and breakdown of the same tissues.

Beran (F.). **Pflanzenschutzmittel. (Verzeichnis 1935.)** [Plant protectives. (List for 1935).]—*Neuheiten PflSch.*, xxviii, 2, pp. 37–46, 1935.

Particulars are given in tabular form of the origin, purposes, and mode of application of the insecticides, fungicides, stimulants and soil disinfectants, and other agricultural preparations officially recommended by the Austrian Federal Institute for Plant Protection (Vienna II, Trunnerstr. 1).

Borchers (F.) & May (E.). **Methoden zur Prüfung von Pflanzenschutzmitteln. VIII. Betrachtungen und Untersuchungen über die physikalischen Eigenschaften staubförmiger Pflanzenschutzmittel.** [Methods of testing plant protectives. VIII. Observations and investigations on the physical properties of plant protective dusts.] —*Mitt. biol. Anst.* (*Reichsanst.*) *Berl.*, 50, pp. 5–55, 8 diags., 3 graphs, 1935.

The authors discuss in some detail the methods in current use in Germany for the testing of plant protective dusts (mostly with reference to their value in the extermination of insect pests in the forest) [cf. *R.A.M.*, xii, p. 577] in respect of such matters as specific gravity, particle size and shape, suspensory properties in air and tendency to clumping, adhesiveness, facility of dispersion, and hygroscopicity.

BABEL (A.). **Beizmethoden.** [Steeping methods.]—*Nachr. Schädl-Bekämpf., Leverkusen*, x, 1, pp. 28–37, 12 figs., 1935.

Particulars of the purpose and application, together with illustrations, are given of the following apparatus now in current use in Germany for the disinfection of cereal and other seeds: Degesch (liquid), Lothrä, Primus, Puk, Globus, Klein-Tillator, and Neusaat-Grosstillator (dusting), and Primus, Miag, and Kontramix (short disinfection process), all of which have already been referred to from time to time in this *Review*.

HEGE (R.). **Încercări cu aparate de stropit.** [Trials of spraying apparatus.]—*Anal. Inst. Cerc. agron. Român.*, vi, pp. 353–401, 26 figs., 5 graphs, 1934. [German summary. Received June, 1935.]

After a brief exposition of the chief theoretical desiderata which should be fulfilled by spraying apparatus, the author gives an account of the results of official trials in Rumania in 1932–3 of thirteen sprayers of different types presented by one Rumanian and five foreign firms, the working of which is described in some detail. The advantages and disadvantages of each apparatus in relationship to local soil and cultural conditions are discussed in some detail.

DE ONG (E. R.). **The use of oil-soluble copper as a fungicide.**—*Phytopathology*, xxv, 3, pp. 368–370, 1935.

Determined by the colorimetric method described in *Bull. U.S. Dep. Agric.* 785, 1919, 80 per cent. of copper was recovered after thirty days from apricot leaves and twigs and plum twigs sprayed in the late autumn with a highly concentrated Bordeaux mixture, but none could be detected in the tissue by H. Martin's method of digesting the twigs after removal of the surface copper. The corresponding amount of copper recovered from the surface twigs treated with palustrex (copper resinate dissolved in a pine-tar oil) [*R.A.M.*, xii, p. 182] was 60 per cent.; within the tissue was a further 21 per cent. of the total amount applied, indicating that this substance penetrates the interior of leaves and twigs to such an extent as to be recoverable in demonstrable quantities. No doubt the uniformity of external and internal distribution, coupled with economy in the use of copper, largely accounts for the increasing popularity of this very efficacious fungicide in California.

HORSFALL (J. G.). **Pasteurizing soil electrically to control damping-off.** —*Bull. N.Y. St. Agric. Exp. Sta.* 651, 8 pp., 3 figs., 1935.

An account is given of tests carried out under commercial conditions in New York with an appliance designed to sterilize greenhouse soil electrically [*R.A.M.*, xiv, p. 460]. It consists of a container made of boiler plate insulated on the outside and holding 1 cu. yd. of soil; heat is furnished by electric elements covered with aluminium fins to disperse it into the soil. The consumption of current amounts to 5 kw. per hour at 220 volts, but the chief advantage of the machine is that the soil is heated in four hours or more, depending on its coldness or wetness, to a relatively low temperature (45° to 50° C.), after which the current is turned off and the heat in the soil allowed to act on it for twelve hours or more. Pasteurization by this means gave satisfactory control of

damping-off (due chiefly to *Pythium ultimum* [ibid., xiv, p. 382] and to a less extent to *Rhizoctonia* [*Corticium*] *solani* and *Botrytis* sp.) without injuring the soil.

LESZCZENKO (P.). **Wpływ nawożenia mineralnego na stan zdrowotności roślin uprawnych.** [The effect of mineral fertilization on the health of cultivated plants.]—*Prace Wydz. Chor. Rośl. państw. Inst. Nauk Gosp. wiejsk. Bydgoszczy* 14, pp. 51–78, 1935. [French summary.]

The author gives a fairly full review of the investigations carried out during the last ten or fifteen years on the effect of mineral fertilizers on the health and disease resistance of cultivated plants, with special reference to cereals, potatoes, beets, and other industrial crops [most of which have been noticed from time to time in this *Review*]. His chief aim in publishing this paper is to stimulate similar research in Poland, where but little, according to him, has been done so far on the problem of the possibility of controlling certain fungal diseases and insect pests by fertilizers. He considers that the results obtained by foreign workers show fair promise, even though some of them are not quite conclusive and require confirmation.

PITTMAN (H. A.). **Some serious plant diseases in Western Australia which are brought about by unusually high temperatures.**—*J. Dep. Agric. W. Aust.*, Ser. 2, xii, 1, pp. 1–7, 4 figs., 1935.

After distinguishing between parasitic and non-parasitic plant diseases and listing some of the commonest of each kind found in Western Australia, the author discusses how the conditions that prevail during heat waves cause injury to plants and briefly describes a number of diseases due to such factors, including burning-back of vine, loquat [*Eriobotrya japonica*], and plane-tree leaves, 'wind-injury' of wheat heads (caused by the withdrawal of water from the ears by the excessive transpiration of the leaves), internal decline of lemons [*R.A.M.*, xii, p. 214], blossom-end rot of tomatoes [ibid., xii, p. 733], blotchy core of apples [ibid., ix, p. 322], and water-core and heat crinkle of apples [ibid., xi, p. 55] and Japanese plums [?*Prunus salicina*]. The paper concludes with brief directions for the mitigation of the effects of excessive heat by improved cultural practices.

GARDNER (H. A.), HART (L. P.), & SWARD (G. G.). **Mildew prevention.**—*Circ. Nat. Paint, Varn. Lacq. Ass., Inc., Sci. Sect.* 475, 13 pp., 1935. [Abs. in *Build. Sci. Abstr.*, viii (N.S.), 4, pp. 126–127, 1935.]

For white or pale-coloured paints on a white base zinc oxide is stated to be a very satisfactory pigment from the standpoint of mildew resistance [cf. *R.A.M.*, x, p. 525; xiv, p. 137], while mercuric chloride, phenyl mercuric acetate, or ammoniated mercury may be added to the finishing coats in ratios of about 1 : 500 to 1 : 900. Such additions have been found to render the coatings practically free from fungal invasion. Red cuprous oxide is similarly effective for red and brown coatings, while good results have also been given by spar varnish. Thymol is less efficacious for outdoor purposes, but is useful for the interiors, e.g., of bakeries, textile mills, or other buildings in which high temperatures may prevail and the employment of mercury compounds is undesirable.

Johnson (J.) & Hoggan (Ismé A.). **A descriptive key for plant viruses.** —*Phytopathology*, xxv, 3, pp. 328–343, 1935.

Discussing the need for a more complete and systematic description of plant viruses, the writers recapitulate their previous arguments [*R.A.M.*, vi, p. 501; viii, p. 592] in favour of using as a basis the characters of the virus itself rather than the symptoms induced by its action (see also *Science*, N.S., lxxiii, p. 29, 1931). The following are believed to be the chief diagnostic features of a virus that are of value for descriptive purposes: (1) modes of transmission; (2) natural or differential hosts; (3) longevity *in vitro*; (4) thermal death point; and (5) certain distinctive or specific symptoms [cf. *R.A.M.*, x, p. 747; xi, p. 591; xiii, p. 719]. Transmission by sucking insects and the identity of the vector concerned, together with mechanical transmission by plant extracts and transmission by grafting, are considered to provide the main bases for differentiation. Utilizing chiefly these criteria, a descriptive key for plant viruses is given in tabular form, placing some fifty of the known viruses in several fairly well-defined groups bearing a certain natural relationship to one another, further intensive study of which may furnish a logical foundation for classification.

Takahashi (W. N.) & Rawlins (T. E.). **The relation of stream double refraction to Tobacco mosaic virus.**—*Science*, N.S., lxxxi, 2099, pp. 299–300, 1935.

The writers have previously shown that material causing stream double refraction (M.C.S.D.R.) occurs in higher concentration in mosaic than in healthy tomato juice [*R.A.M.*, xiv, p. 201]. Assuming that most of the S.D.R. produced by the juice of plants infected by tobacco mosaic is due to the virus particles of the latter, a positive correlation would be expected between the virus concentration and M.C.S.D.R. The experiments [which are briefly described] undertaken to gain information on this point gave somewhat inconclusive results, but the indications are that S.D.R. is a function of the particles.

Smith (Elizabeth C.). **Effects of ultra-violet radiation and temperature on Fusarium. II. Stimulation.**—*Bull. Torrey bot. Cl.*, lxii, 3, pp. 151–164, 4 graphs, 1935.

The results of further experiments with *Fusarium eumartii* [*R.A.M.*, xiv, p. 386] are considered to indicate that the stimulation of vegetative growth of the fungus which in some cases followed its exposure to ultra-violet radiation (but never except after an initial retardation), is merely an indirect effect of radiation and a direct effect of retardation. This view is supported by the facts that other factors which produce an initial retardation also result in stimulation, and that temperature and nutritional conditions favouring growth of the fungus also favour stimulation. It is suggested that factors promoting the formation and accumulation in the fungus of labile products also promote stimulation after retardation. On the other hand, there was an indication that ultra-violet radiation may have a direct rather than an indirect stimulative effect on spore production, the maximum production occurring after a 30-second exposure regardless of the rate of growth of the fungus.

Ward (G. E.), Lockwood (L. B.), May (O. E.), & Herrick (H. T.). **Production of fat from glucose by moulds. Cultivation of Penicillium javanicum van Beijma in large-scale laboratory apparatus.**—*Industr. Engng Chem.*, xxvii, 3, pp. 318–322, 1 diag., 1935.

A survey of sixty-one species of *Aspergillus* and *Penicillium* indicated that one of the former (*A. flavus*) and nine of the latter contained over 15 per cent. ether-soluble material (*P. piscarum* Westl. and *P. flavo-cinereum* Biourge 26 to 28 and 28·5 per cent., respectively) when grown with glucose. An intensive study of *P. javanicum* van Beyma [*R.A.M.*, xiii, p. 474] showed that its mycelium may contain up to 41·5 per cent. fat, depending on cultural conditions.

A cabinet for the experimental study of large-scale shallow-pan fermentations is described, following the basic design of the sterilizer-incubator described by Birkinshaw *et al.* (*Philos. Trans.*, B, ccxx, pp. 136, 366, 1931) and somewhat resembling that of Petersen *et al.* (*Industr. Engng Chem.*, xxv, p. 213, 1933), and representative results of culture trials conducted therewith are presented. Under such conditions, increase of the glucose content of the medium does not appear to involve a parallel augmentation in the fat content of the *P. javanicum* mycelium, as is the case in flask cultures. The free fatty acid content of the fat obtained from the mycelium grown on 30 and 40 per cent. glucose solutions is much higher than that of fat similarly derived from 20 per cent. glucose solutions. Besides fat, the mycelium of *P. javanicum* yielded a complex carbohydrate and a chitinous material.

Prill (E. A.), Wenck (P. R.), & Peterson (W. H.). **The chemistry of mould tissue. VI. Factors influencing the amount and nature of the fat produced by Aspergillus fischeri.**—*Bio-chem. J.*, xxix, 1, pp. 21–33, 1 graph, 1935.

Appreciable differences were noted in regard to the amount and nature of the mycelial fats produced by one stock and eight monospore cultures of *Aspergillus fischeri* [*R.A.M.*, xii, p. 529 and preceding abstract]. The production of mycelia with high fat contents was promoted by neutral or slightly alkaline media, a high initial concentration of cerelose (commercial glucose), and a low ammonium nitrate concentration. The production of increased amounts of ergosterol in the mycelium was favoured by a fairly high initial concentration of glucose, 1 per cent. ammonium nitrate or an initially acid medium containing an equivalent amount of urea, a higher temperature (37° C.), and a protracted incubation period. Augmented phospholipin production resulted from a low initial glucose content, 1 per cent. ammonium nitrate, and an initially slightly acid medium. During inanition the bulk of the fat was utilized by the fungus.

Henrard (P.). **Polarité, hérédité et variation chez diverses espèces d'Aspergillus.** [Polarity, heredity, and variation in different species of *Aspergillus*.]—*Cellule*, xliii, 3, pp. 351–424, 6 pl., 1934.

A study [which is fully described] of polarity, heredity, and variation in nineteen different species of *Aspergillus* of the *A.* '*glaucus*' series, using monoascospore cultures, showed that all the germinating monospore cultures produced normal perithecia, thus demonstrating strict

sexual homothallism. *A. nidulans* was also sexually homothallic, though it is physiologically 'bipolar' or heterothallic; this character became apparent only when two strains of opposite polarity met, in which case they fell into two physiological classes, referred to as A and a. Bipolarity was shown at the line of junction in the formation of a red stripe underneath the cultures and in arrested growth on the surface; this arrest of growth was sometimes confined to the conidiophores, in other cultures it consisted in a true mycelial barrier, and occasionally it favoured the production of a very thick row of perithecia on either side of the line of junction. None of these phenomena occurred when the strains that met belonged to the same physiological class. A variant (*A. nidulans imminutus*) [which is described] appeared on several occasions in certain monoascospore cultures of *A. nidulans*; it was apparently stable, but there was insufficient evidence to establish it definitely as a mutant since it did not form ripe ascospores and it is not known whether its distinctive characters are transmissible by the ascospores. A second variant (*A. nidulans fertilior*) [which is also described] occurred once, as a result of mutation, and remained stable through both conidial and ascosporal generation. In both forms the physiological bipolarity of the parent strains survived variation and mutation.

Punkari (Laila) & Henrici (A. T.). **Further studies on spontaneous variations of Torula pulcherrima.**—*J. Bact.*, xxix, 3, pp. 259–267, 3 diags., 1935.

Variations in the chromogenic, asporogenous yeast, *Torula pulcherrima*, have been studied through six further generations [*R.A.M.*, xiii, p. 47]. Among the new variants are colonies with red soluble pigment, and white ones with craters which are regarded as a form of 'roughness'. The white variants have shown much greater stability than the red parent type. The former generally arise from red in the actively growing peripheral cells of the colony, whereas the red develop from white in the older central portions.

Koch (K.) & Johnson (J.). **A comparison of certain foreign and American Potato viruses.**—*Ann. appl. Biol.*, xxii, 1, pp. 37–54, 3 pl., 1935.

A brief account is given of the authors' comparative studies of the viruses obtained from apparently healthy and virus-diseased potato tubers sent from Australia (eight varieties), Brazil (six varieties), Bulgaria (sixteen varieties), England (four varieties), Germany (four varieties), Holland (six varieties), Irish Free State (four varieties), Japan (two varieties), and the U.S.S.R. (twenty-five varieties). The experimental procedure consisted in inoculating Bliss Triumph potatoes free from the ordinary virus diseases but carrying the 'mottle' virus and often the potato 'ring spot' virus, and tobacco plants (Connecticut Havana No. 38) with extracted juice from plants raised from the imported tubers. If infection resulted on either host, the virus or viruses thus isolated were compared, as far as possible, with other related forms of American occurrence. Viruses not transmissible mechanically by plant extracts were not considered.

The results showed that the potato 'mottle' virus [*R.A.M.*, xii, p. 588], which has been shown to occur regularly in all tubers of most,

if not all, standard American varieties, was present in one or more varieties from each of the nine foreign countries mentioned above, the proportion being lowest (1 in 5) from Brazil and highest (6 in 8) from Australia. Inoculations into tobacco failed to give any evidence suggesting that the 'mottle' virus secured from the various sources was different from the American. The potato 'ring spot' virus as known in America [loc. cit.] was found in association with practically all cases of mottle [ibid., xiv, pp. 385, 388] in foreign potatoes, except in the Bulgarian ones. A few cases of questionable ring spot were noted in potatoes from Holland, Ireland, and Russia, suggesting that the symptoms may vary within a wider range than recognized in America, or else that the cases in question were caused by still another, as yet undetermined, virus.

The veinbanding virus [ibid., xiii, p. 463; xiv, p. 385] was found in an apparently 'pure' state in potatoes from Holland, Germany, Bulgaria, Australia, and England (potato Y virus) [ibid., xiv, p. 246], and from Brazil only in combination with leaf roll; material from Ireland, Japan, and Russia failed to yield this virus, though it undoubtedly occurs in these countries. Comparative studies on the veinbanding virus from Bulgaria, Brazil, Germany, and the United States, and the Y virus from England, showed that the thermal death point, longevity *in vitro*, and tolerance to dilution of all these forms are essentially the same, and that all the forms from the different sources cause identical symptoms on tobacco and potato, with the exception of the English Y virus which failed, when inoculated into Bliss Triumph potato, to produce the typical symptoms of American rugose mosaic, although it yielded typical spot necrosis on tobacco. This, taken in conjunction with the fact that *Solanum nigrum* was apparently immune from the Y virus but susceptible to the veinbanding virus, and that slight differential symptoms appear on tobacco when the two viruses are combined with either the mottle or the ring spot virus, leads the authors to conclude that Smith's Y virus is not identical with the American veinbanding virus, which appears to be the more common and universally distributed of the two forms.

Typical crinkle mosaic virus [ibid., xii, p. 48] was secured from Australia and Japan, and also found in potatoes from Ireland reported as affected with crinkle, and in potatoes from England reported as containing 'crinkle A' [ibid., xiii, p. 257]. While admitting that the problem of the association of the conditions described as potato streak and leaf drop with any particular viruses still remains obscure, a tentative description is given of a 'potato streak virus' which was found in President potatoes from Ireland, and which is apparently not transmissible by *Myzus persicae* or *Macrosiphum solanifolii* [*M. gei*] but is transmissible mechanically. Its resistance to ageing *in vitro* is from four to six days at about 22° C., and its thermal death point is between 55° and 58° (10 min.). Primary infection causes distinct necrotic, streak-like symptoms on leaf veins, laminae, and stems of potato (Bliss Triumph and Green Mountain), generally resulting in the death of the bud, followed by a downward necrosis which may kill the whole plant. On tobacco it causes an indefinite and mild necrosis in the form of irregular blotches. The host range and distribution of this virus are not known.

Baribeau (B.). **The tuber-unit seed plot in Quebec.**—*Amer. Potato J.*, xii, 3, pp. 62–64. 1935.

The following record of a potato tuber-unit seed plot at Ste. Anne de la Pocatière, Quebec, is considered clearly to demonstrate the value of this method of combating virus diseases [*R.A.M.*, xii, p. 50]. In 1928 a tuber-unit plot measuring approximately $\frac{1}{10}$ acre was started with Green Mountain seed from the 1927 commercial crop, a high percentage of virus-infected plants being removed; the following year the commercial field was planted with selected seed for the first time. Thenceforward the yields in the commercial field planted from the plot steadily rose from 369·1 bushels per acre in 1929 to 417 in 1934, as against 287·7 in 1928.

Stapp (C.). **Beitrag zur Frage der Widerstandsfähigkeit verschiedener Kartoffelsorten gegen Schwarzbeinigkeit und Knollennassfäule, verursacht durch Bacillus phytophthorus App.** [A contribution to the question of the resistance of different Potato varieties to blackleg and tuber wet rot caused by *Bacillus phytophthorus* App.]—*Angew. Bot.*, xvii, 2, pp. 97–117, 1935.

The results [which are tabulated and discussed] of six years' field experiments (1928 to 1934) at Berlin-Dahlem on the reaction of thirty potato varieties to seed-tuber inoculation by injection of the flesh with a suspension of two very virulent strains of *Bacillus phytophthorus* [*R.A.M.*, viii, p. 396] showed two to be highly resistant, viz., Alte Daber and Flava, five (including Beseler and Konsum) slightly susceptible, nine (including Goldappel, Arnica, Deodara, Dir. Johanssen, Cellini, and Glückauf) very susceptible, and eight (including Juli, Preussen, and Erdgold) excessively so. There was some evidence, not altogether conclusive, of a correlation of late maturity and white flesh colour with resistance, but no definite connexion could be traced between the latter character and skin thickness (except indirectly, since the organism is a wound parasite or reaches the tuber through the stolon), capacity for wound periderm formation, or rapidity of decay [ibid., xiii, p. 391].

Ledingham (G. A.). **Occurrence of zoosporangia in Spongospora subterranea, Wallroth (Lagerheim).**—*Nature, Lond.*, cxxxv, 3410, p. 394, 4 figs., 1935.

At the National Research Laboratories, Ottawa, Canada, tomato and potato seedlings were planted in soil inoculated, after steam sterilization, with spore balls of *Spongospora subterranea* from diseased potato tubers. Heavy infection developed in the root hairs of both hosts in a fortnight at 65° F. All stages in the evolution of the organism were observed from amoebae that had just penetrated the host to mature zoosporangia, the latter sometimes occurring singly in the root hairs or epidermal root cells but more often lying in rows or clusters of up to a dozen or more, nearly filling the host cell. The formation of clusters instead of a single zoosporangium appears to be effected by a budding process. Zoospore discharge is accomplished through a rupture in the host cell wall induced by pressure from a swelling developing at a certain point in the zoosporangium. The zoospores from zoosporangia (not

hitherto described in the life-history of *S. subterranea*) resemble those from germinating spore balls in size, shape, ciliation (two cilia of unequal length), and manner of swimming [*R.A.M.*, xiii, p. 599]. A possible fusion of gametes is suggested by the presence of occasional binucleate spores with four cilia.

Szymański (W.). **Studja biochemiczne nad porażeniem Ziemniaków grzybkiem raka ziemniaczanego, Synchytrium endobioticum (Schilb.) Perc. II. Różnice koncentracji jonów wodorowych oraz ilości kwasów w soku kielków zdrowych i porażonych.** [Biochemical studies on the infection of Potatoes with the Potato wart fungus, *Synchytrium endobioticum* (Schilb.) Perc. II. Differences in the concentration of hydrogen-ions and in the quantity of acids in the sap of healthy and infected germinating sprouts.]—*Prace Wydz. Chor. Rośl. państw. Inst. Nauk Gosp. wiejsk. Bydgoszczy* 14, pp. 107–123, 3 graphs, 1935. [French summary.]

Continuing his biochemical studies on the potato wart disease (*Synchytrium endobioticum*) [*R.A.M.*, xii, p. 718] the author describes experiments with Early Rose potatoes, the results of which showed that, as determined directly in sprouting tubers, the hydrogen-ion concentration was highest (P_H 5·215) in healthy sprouts, lower (5·46) in warted sprouts, and lowest (6·22) inside the tubers. The same relationship was also shown to hold for the sap extracted from the different organs, although the acidity of the expressed juices rapidly declined on standing in every case. The P_H value of the sap of infected sprouts is nearer to that of wart outgrowths than to the P_H value of the sap in healthy sprouts.

Garbowski (L.) & Leszczenko (P.). **Sprawdzanie odporności Ziemniaków na raka Ziemniaczanego, Synchytrium endobioticum (Schilb.) Perc.** [Trials of Potatoes for resistance to Potato wart disease, *Synchytrium endobioticum* (Schilb.) Perc.]—*Prace Wydz. Chor. Rośl. państw. Inst. Nauk Gosp. wiejsk. Bydgoszczy* 14, pp. 5–28, 1 pl., 1935. [French summary.]

Of the 180 [listed] varieties of potatoes of various origin that were tested in 1932 and 1933 in Poland for resistance to wart disease (*Synchytrium endobioticum*) in the laboratory and in the field [*R.A.M.*, xi, p. 743], the highest resistance, amounting to entire immunity, was shown by certain varieties from Scotland, namely, Ally, Arran Banner, Arran Crest, Great Scot, Golden Wonder, and Majestic; Incomer was only infected in the laboratory, and should be tested further, while Kerr's Pink showed initial stages of infection, but did not develop either warts or winter sporangia. High resistance was also exhibited by the Polish varieties Marszalek, Palatyn, Direktor Johanssen, and Beta; the German varieties Beseler, Maibutter, Parnassia, Paul Wagner, Roon, Albabona, Berlichingen, Berolina, Hellena, Jubel, Juli, Pepo, Rosafolia, and Wekaragis; and the Dutch variety Robijn. All the other varieties were more or less susceptible.

Small (T.). **Prevention of blight (Phytophthora infestans) in seed Potatoes.**—*Ann. appl. Biol.*, xxii, 1, pp. 16–22, 1935.

Brief details are given of experiments in Jersey in 1932, the results

of which showed that regular and thorough spraying of potato haulms was very effective in controlling tuber rot caused by late blight (*Phytophthora infestans*) at harvest time, but not the rot developing in storage, especially in seed tubers. Removal from the field or scorching of the haulms *in situ* with an acid spray (e.g. 12 lb. copper sulphate and ¼ lb. caustic soda in 40 galls. water) three days prior to digging gave good control of the storage rot of seed tubers, as did also dipping the tubers in a fungicide immediately after digging [*R.A.M.*, xiii, p. 591].

Rieger (H.). **Phytophthora-Vorbeuge und Bekämpfung.** [*Phytophthora* prevention and control.]—*Dtsch. landw. Pr.*, lxii, 11, p. 135, 2 figs., 1935.

Strikingly good results are stated to have been obtained in the control of potato blight (*Phytophthora infestans*) on moorland soils in Upper Bavaria during the last two years by two applications (beginning and middle of July) of Wacker's Bordeaux mixture (Drawingesellschaft, Prinzregentenstr. 20, Munich) [*R.A.M.*, xiv, p. 79], the first at a strength of 1·5 and the second at 1 per cent. The varieties treated were all early ones, namely, Erstling [Duke of York], Early Rose, Kaiserkrone, Odenwälder Blaue, and Böhms Allerfrüheste Gelbe, the yields of which were increased by as much as 125 doppelzentner per hect. The cost of one treatment was estimated at M. 5 per hect.—an area that can be covered in one day by a man with a knapsack apparatus.

Leszczenko (P.). **Rhizoctonia solani K. (Hypochnus solani P. et D.) na Ziemniakach.** [*Rhizoctonia solani* K. (*Hypochnus solani* P. & D.) on Potatoes.]—*Prace Wydz. Chor. Rośl. państw. Inst. Nauk Gosp. wiejsk. Bydgoszczy* 14, pp. 29–49, 1 pl., 1935. [English summary.]

The author states that during the last few years potatoes in Poland have suffered increasingly from attacks by *Rhizoctonia* [*Corticium*] *solani* both on the tubers and on the stems, presumably owing to weather conditions. In pot experiments with pure cultures of the fungus he established that it is in a large measure responsible for the rot of germinating potato sprouts which has been repeatedly observed in the country, and that soil moisture greatly favours this trouble. Applications of superphosphate and basic slag did not appear to affect the incidence of the rot. Good control of the disease in the field was obtained by dipping seed tubers for 1½ hours in a 0·1 per cent. mercuric chloride or a 0·125 per cent. uspulun solution [cf. *R.A.M.*, xiv, p. 118], but less satisfactory results were given by 30 minutes' immersion in 0·5 per cent. formaldehyde solution or by dusting the tubers with abavit B. Observations on the field behaviour of a large number of potato varieties to the disease during the period from 1930 to 1932, inclusive, are summarized in a table.

Van der Slikke (C. M.). **Verslag van Rijkstuinbouwproefvelden over grondontsmetting tegen de Rhizoctoniaziekte en de schurft op Aardappelen.** [Report of the State horticultural field-plot tests on soil disinfection against *Rhizoctonia* disease and scab of Potatoes.] —*Tijdschr. PlZiekt.*, xli, 3, pp. 65–73, 1935.

The treatment of planting holes with ¼ l. of 0·05 per cent. mercuric

chloride or with ⅛ l. of a 0·1 per cent. solution was found to be very effective against the *Rhizoctonia* disease of potatoes [*Corticium solani*] in Holland [cf. *R.A.M.*, viii, p. 806, and preceding abstract]. The temporary depression in the early period of growth resulting from the treatment had no permanent effect, except in the case of early lifting of early varieties. Good results were also obtained by this method (using ¼ l. of a 0·1 per cent. solution) in scab [*Actinomyces scabies*] control. The treatment can necessarily be only partially effective in such varieties as Eigenheimer, in which the tubers develop at a considerable distance from the plant hole.

LAURITZEN (J. I.). **Factors affecting infection and decay of Sweet Potatoes by certain storage rot fungi.**—*J. agric. Res.*, l, 4, pp. 285–329, 2 graphs, 1935.

The results of experiments at Washington, D.C., and the Arlington Experiment Farm, Virginia, showed that the nature of the fungal rots that develop in sweet potatoes during storage [*R.A.M.*, xiv, p. 118] largely depends on the local occurrence of the causal organisms. *Rhizopus nigricans*, *R. tritici*, *Fusarium oxysporum*, and species of this last genus causing end rot are the most generally distributed, while *Diplodia tubericola* and *Sclerotium bataticola* [*Macrophomina phaseoli*] are less widespread and more restricted to the southern part of the sweet potato-growing belt. More or less extensive wounding appears to be an essential condition for the primary infection of sweet potatoes by any of these fungi, the further progress of which is favoured by storage conditions of temperature and humidity tending to prevent or greatly retard the formation in the roots of a wound periderm layer which acts as an effective barrier against infection and retards shrivelling of the roots.

The rest of the paper is given to a detailed account of experiments, the results of which were summarized in a recent publication on the prevention of storage rots in sweet potatoes [loc. cit.].

HIROE (I.). **Experimental studies on the saltation in fungi (preliminary report) IX. On the biological characters of pseudo-myceliolyse.**—*Ann. phytopath. Soc. Japan*, iv, 3–4, pp. 178–190, 8 figs., 1935. [Japanese, with English summary.]

The writer has investigated the biology of the phenomenon of pseudo-myceliolysis [*R.A.M.*, xii, p. 584] in the rice leaf spot fungus *Ophiobolus miyabeanus* [see next abstract]. The optimum temperature for the process on potato sucrose-agar was found to range from 23° to 28° C., with particularly clear-cut results at 24°, the minimum and maximum being just above 16° and below 37°, respectively. Other favourable media for the observation of pseudo-myceliolysis were rice straw decoction, synthetic media with asparagin and peptone, maize meal, and apricot decoction; on onion and soy agar the phenomenon did not occur. The inception of pseudo-myceliolysis was detected in 54 to 74 (average 64) hours after inoculation at 32° and 49 to 69 (average 59) hours at 23°; the entire process occupied a period of some 20 hours.

Tullis (E. C.). **Histological studies of Rice leaves infected with Helminthosporium oryzae.**—*J. agric. Res.*, l, 1, pp. 81–90, 6 figs., 1935.

The histological studies briefly reported in this paper showed that *Helminthosporium oryzae* (the conidial stage of *Ophiobolus miyabeanus*) [*R.A.M.*, xiv, p. 468] may enter rice leaves through a stoma or may penetrate directly into the cells of the epidermis, invasion appearing to occur most frequently in the motor cells which are often almost entirely filled with the mycelium of the fungus. The mycelium then passes into the intercellular spaces of the photosynthetic area of the leaf, and in the more susceptible varieties this invasion progresses rapidly, until the leaf spots frequently extend from the midrib to the margin. The deeper hyphae frequently arise from a subepidermal mycelium that extends through the substomatal spaces along the leaf. The fibro-vascular bundles tend to form barriers against the lateral spread of the fungus, and penetration of the bundle sheath cells is necessary to permit of invasion of adjacent new areas; this apparently is accomplished much more easily in some varieties than in others, and does not occur at all in very resistant ones. In resistant varieties the progress of the fungus is also impeded by the formation in the tissues of yellowish-brown deposits which accumulate in the intercellular spaces in advance of the invading hyphae, and the chemical nature of which has not been determined.

Fawcett (G. L.). **Una nueva enfermedad del Arroz en Tucumán: la brusone (Piricularia oryzae).** [A new Rice disease in Tucumán: blast (*Piricularia oryzae*).]—*Circ. Estác. exp. agríc. Tucumán* 42, 6 pp., 1 fig., 1935.

Attention is drawn to the recent detection for the first time in Tucumán, Argentine Republic, of rice blast (*Piricularia oryzae*) [*R.A.M.*, xiii, p. 725], so far in a relatively mild form and affecting chiefly the late-sown dry-land varieties, though a very low incidence of infection (1 per cent. or less) was also observed in Blue Rose crops under irrigation; Fortune appeared to be practically immune. The disease is stated to be most prevalent in plantations belonging to rice mills and the like, for which seed imported from Brazil during the last two years has been used. In view of the formidable character of rice blast in other countries, no effort should be spared to prevent its further spread in the Argentine. An important control measure, in addition to the usual sanitary practices, consists in the exclusion from rice fields, so far as possible, of fodder grasses, of which *Panicum sanguinale*, at any rate, is susceptible to blast. It is recommended to grow crops such as maize, lucerne, &c., in infected fields for one or two years before again growing rice.

Lepik (E.). **Über die Krankheiten der Arzneipflanzen in Estland.** [On the diseases of drug plants in Esthonia.]—*Mitt. phytopath. Vers Sta. Tartu* [*Dorpat*] 24, 8 pp., 1935. [German summary.]

A briefly annotated list is given of the more serious fungal diseases which were observed in 1934 on drug plants grown in the neighbourhood of Tartu [Dorpat], including *Cercospora traversiana* (recorded for the

first time in Esthonia) on *Trigonella foenum-graecum* [*R.A.M.*, xiv, p. 286], *Erysiphe artemisiae* on *Artemisia vulgaris* (but not on adjacent *A. absinthium*), *E. valerianae* on *Valeriana officinalis*, and *Macrosporium saponariae* on *Saponaria officinalis*. Considerable damage to peppermint (*Mentha piperita*) during the summer was caused by *Puccinia menthae* [ibid., xiii, p. 668], which was also found on *M. arvensis*, *Calamintha acinos*, *Clinopodium vulgare* [*Calamintha clinopodium* Benth.], and *Satureia hortensis*. Since 1925 certain cultivated species of *Iris* have been increasingly attacked by rust (*Puccinia iridis*); the fact, however, that infection was restricted to certain species and the indigenous *I. pseudacorus*, *I. germanica*, and *I. sibirica* remained immune is considered to indicate that this rust is physiologically different from the form which is occasionally found on the native species [cf. ibid., xiii, p. 380].

Martin (J. P.) & Carpenter (C. W.). **Sugar Cane pathology.**—*Proc. Hawaii. Sug. Pl. Ass., 1934*, pp. 113–124, 1935.

In this paper the authors list the sugar-cane diseases until now excluded from Hawaii by the quarantine regulations in force in the Territory, and give brief notes on the causes and control of those actually present, viz. brown stripe (*Helminthosporium stenospilum*) [*R.A.M.*, xiii, p. 655], chlorotic streak [fourth disease: ibid., xiii, pp. 654, 686], eye spot (*H. sacchari*) [ibid., xiii, p. 12], leaf scald (*Bacterium albilineans*) [ibid., xiii, p. 472], mosaic [ibid., xiii, p. 471], and root rot (*Pythium graminicolum*, formerly referred to as *P. aphanidermatum*) [ibid., xii, p. 723].

Lyon (H. L.). **Botany, forestry and pathology.**—*Rep. Hawaii. Sug. Exp. Sta. 1934* (*ex Proc. Hawaii. Sug. Pl. Ass., 1934*), pp. 27–37, 1935.

This report contains, among others, the following items of phytopathological interest. Experiments by J. P. Martin failed to demonstrate the cause and manner of transmission (otherwise than by cuttings) of sugar-cane chlorotic streak [see preceding abstract]; further investigations are in progress. Suspect planting material should be submitted to the hot water treatment (52° C. for 20 minutes).

When sugar-cane was grown in water cultures deficient in elements essential to growth, *Pythium graminicolum* [loc. cit.] became a seriously injurious factor, particularly when any of the following elements were lacking: iron, phosphorus, sulphur, manganese, potassium, magnesium, or calcium, most injury occurring in the minus-calcium series. In the minus-nitrogen series, on the other hand, root growth was stimulated and no infection took place. Studies by C. W. Carpenter showed that nitrogen in excess for any particular variety conduces to susceptibility to *P. graminicolum* both in virgin soil and in soils where the disease is not usually present. Deficiency of available phosphate promoted infection and growth failure in varieties not markedly susceptible to the effects of excess nitrogen, though P.O.J. 2878 tolerated a high nitrogen and a low phosphate content and maintained considerable resistance to infection. Abundant soil moisture and a soil temperature of 70° F. or under favoured attack.

J. P. Martin found that leaf scald [*Bacterium albilineans*: loc. cit.] was not satisfactorily controlled by the hot water treatment. Under field conditions the disease is transmitted mainly in cuttings and on the knives. Observations over a period of years showed that it is much more serious on the leeward than on the windward side of Hawaii and the neighbouring islands, and that it is particularly prevalent in areas of high temperature and low rainfall. Definite symptoms of Pahala blight [*R.A.M.*, xii, p. 788] were induced by growing the canes in nutrient solutions lacking manganese, normal growth being resumed when manganese was added.

Report on the British West Indies Central Sugar Cane Breeding Station for the year ending September 30th, 1934.—20 pp., [? 1935.]

Among the items of phytopathological interest in this report may be mentioned the investigations of the Assistant Botanist (G. C. Stevenson) on gumming disease of sugar-cane (*Bacterium vascularum*) [*R.A.M.*, xiii, p. 803]. From six months' observations in Barbados on twenty varieties of widely differing reaction to the disease, interplanted with the very susceptible Ba. 11569, it is evident that, in general, a high degree of susceptibility to leaf symptoms is correlated with extensive systemic infection. For practical purposes, therefore, varieties showing few or no leaf symptoms may be regarded as resistant to gumming disease, while it is at least probable that more serious forms of infection will develop in those contracting severe foliar injuries.

The reaction of over 300 varieties to *Bact. vascularum* has now been established by routine weekly observations in special trial plots, and from the available data the inheritance of resistance to the disease may be studied by calculating resistance fractions for populations from given parentages. Crosses giving a high percentage of susceptible seedlings, e.g., Ba. 11569 × Ba. 6032, are eliminated from the breeding programme.

Matsumoto (T.) & Yamamoto (W.). **Supplementary note on the helminthosporiose of Sugar Cane.**—Appendix to *Contr. phytopath. Lab. Taihoku Univ.* 27, 3 pp., 1 fig., 1935.

As a rectification of their identification of *Helminthosporium ocellum* as the agent of an eye spot disease of sugar-cane leaves in Formosa, Japan [*R.A.M.*, xiv, p. 396], the writers state that further observations on affected material indicate a closer approximation of the disorder to the brown stripe disease caused by *H. stenospilum*.

Fawcett (G. L.). **La fumagina de la Caña de Azucar de Santa Fé y Corrientes.** [Sooty mould of Sugar-Cane in Santa Fé and Corrientes.] —*Rev. industr. agríc. Tucumán*, xxiv, 7–8, pp. 165–167, 1 fig., 1934. [Received June, 1935.]

In June, 1933, and again in May, 1934, specimens of sugar-cane leaves covered by a sooty mould produced by a *Capnodium* or *Meliola* [cf. *R.A.M.*, x, p. 492] were received for examination at the Tucumán Experiment Station, in the former year from Santa Fé and in the latter from Corrientes. Fructifications sufficient to determine the causal fungus were not found. According to one report, no diminution of yield

has so far resulted from the trouble, but this, if actually the case, must be due to its tardy appearance, since the fungus grows in the sugary secretion of some injurious insect (probably Homoptera) and is capable of causing some damage by impeding photosynthesis. The common Argentine sugar-cane sooty mould, *Fumago sacchari*, on the other hand, is stated to be harmless to the plants since it appears to live on the waxy coating of the lower leaves. Studies are in progress to determine the identity of the insect primarily responsible for the newly observed trouble.

Bell (A. F.). **Sick soils.**—*Proc. Qd Soc. Sug. Cane Technol.*, vi, pp. 9–18, 1935. [Abs. in *Facts ab. Sug.*, xxx, 6, p. 226, 1935.]

'Soil sickness', a condition commonly observed where sugar-cane is grown continuously on the same land for many years, may be partially due to the exhaustion of certain elements of soil fertility but also results from the accumulation in the soil of root disease-producing organisms [cf. *R.A.M.*, vii, p. 600]. These may be killed by soil sterilization, following which the cane resumes normal growth, as was proved by the writer's laboratory and field experiments with a particularly susceptible variety, Q. 813, in Woongarra red volcanic soil. With P.O.J. 2878, which is resistant to root rot, the effect of soil sterilization, though not negligible, was much less pronounced than with Q. 813. Since this means of control is obviously impracticable on a large scale in the open field, the problem of sick soils centres round the cultivation of varieties with vigorous root systems, supplemented by the stimulation of root production by the adoption of a complete fertilizer programme.

Sawada (K.). **Materials of the Formosan fungi (30–34).**—*Trans. nat. Hist. Soc. Formosa*, xxiv, 131, pp. 123–129; 134, pp. 298–307; 135, pp. 450–460, 1934; xxv, 136–139, pp. 42–52; 140, pp. 132–139, 1935.

Continuing his studies on Formosan fungi [*R.A.M.*, xiii, p. 398], the writer gives an annotated list (in Japanese except for fungus and host names and bibliographical references) of twenty-two species, of which the following may be mentioned: *Ganoderma lucidum* [*R.A.M.*, xiii, p. 682] on *Acacia confusa*, *Albizzia lebbek*, and *Delonix regia* (Boj.) Raf. [*Poinciana regia* Boj. ex Hook.]; *G. applanatum* on *Acacia confusa*, *Albizzia lebbek*, *Melia azedarach*, mango, *Citrus maxima*, *C. sinensis* var. *brasiliensis* Tanaka, *C. unshiu*, *Bambusa stenostachya*, and *Prunus mume*; *G. rugosum* (*Polyporus rugosus*) on *Acacia confusa*; *Fomes ulmarius* [ibid., xi, p. 616] on *Liquidambar formosana*; *F. noxius* [ibid., xiii, p. 726] on *Bauhinia* sp.; and *Exobasidium camelliae-oleiferae* Sawada n.sp. [with diagnosis in Japanese only] on *Camellia oleifera*.

Stevens (F. L.) & Roldan (E. F.). **Philippine Meliolineae.**—*Philipp. J. Sci.*, lvi, 1, pp. 47–80, 3 figs., 1935.

An annotated list is given of seventy-three Meliolineae collected by the senior author in the Philippines in 1930–1 [cf. *R.A.M.*, vii, p. 743], including thirty-three new species with technical diagnoses in English, three new varieties, and one new combination.

Hiratsuka (N.). **Uredinales collected in Korea I.**—*Bot. Mag., Tokyo*, xlix, 579, pp. 145–152, 1935.

An annotated list is given of sixty-seven Uredinales collected in Korea mostly during 1934 (a few in 1933), of which the following may be mentioned: *Gymnosporangium clavariaeforme* [*R.A.M.*, ix, p. 754] on *Juniperus rigida*; *G. haraeanum* [ibid., xiii, p. 656] and *G. yamadae* [ibid., xii, p. 396] on *J. chinensis*, the former also on *Pyrus sinensis* Lindl. var. *culta* Mak.; *Phakopsora pachyrhizi* on *Glycine max*; and *Cronartium quercuum* [loc. cit.] on *Quercus mongolica*.

Edson (H. A.). **United States of America : Tobacco diseases for 1934 in the Atlantic Coast region.**—*Int. Bull. Pl. Prot.*, ix, 3, pp. 54–55, 1935.

Notes are given on the prevalence of some well-known fungous and bacterial diseases affecting the tobacco crops in the Atlantic Coast region of the United States during 1934.

Thung (T. H.). **Phytopathologische waarnemingen.** [Phytopathological observations.]—*ex* Jaarverslag 1 Mei 1933–30 April 1934.—*Meded. Proefst. vorstenl. Tab.* 81, pp. 25–37, 1935.

Heavy damage was caused in one tobacco plantation during the period under review by a disease hitherto observed only in a sporadic form in the Vorstenland, namely, the so-called 'pox' [*R.A.M.*, viii, p. 204], which has been found to be of virus origin and readily transmissible by the aphid *Myzus persicae*.

The weeding-out from the tobacco beds of *Synedrella nodiflora*, *Ageratum conyzoides*, and *Vernonia cinerea* [the alternate hosts of the Aleyrodidae transmitting 'kroepoek' or leaf curl: ibid., xiv, p. 335] should be started at least a month before planting out and repeated several times to check the new growth and thus ensure the efficacy of the operation.

The 'lanas' disease (*Phytophthora*) [*parasitica nicotianae*: ibid., xiii, p. 806] was almost equally well controlled by two applications of ordinary Bordeaux mixture or bouisol [ibid., xiv, p. 213], the incidence of infection in the seed-beds being reduced from 24·50 to 8·51 and 10·60 per cent., respectively. Promising results were also given in the control of this disease by soil disinfection with large quantities of terbolan, the commercial use of which, however, cannot be recommended as long as the present constant sources of external infection exist.

Extensive observations were made on mildew [*Erysiphe cichoracearum*: ibid., xiii, p. 806] in one plantation. Appreciable infection did not occur until the plants were fully grown, the first symptoms being observed along trenches and other low-lying, damp, shady areas, where the moisture between the plants very probably favours the growth of the fungus. The incidence of infection was found to increase with the age of the plants, so that early harvesting, which precludes the further spread of the fungus, is advantageous. *E. cichoracearum* attacks the broad-leaved varieties, such as E3K and EK, more severely than those of less luxuriant growth, e.g., Kanari and Y10.

HOGGAN (ISMÉ A.). **Two viruses of the Cucumber mosaic group on Tobacco.**—*Ann. appl. Biol.*, xxii, 1, pp. 27–36, 1 pl., 1935.

A brief description is given of a yellow cucumber mosaic virus which in 1928 and 1933 developed apparently spontaneously in tobacco plants that had been inoculated by aphids with ordinary cucumber mosaic [cf. *R.A.M.*, xiv, p. 5] in the greenhouse in Wisconsin. It was readily distinguishable from the latter by the conspicuous bright yellow mottling it produced on cucumbers, tomatoes, pokeweed (*Phytolacca decandra*), spinach, nightshade [*Solanum nigrum*], and eggplant, on which plants it also caused a more severe necrosis of the foliage and a slightly more marked stunting of the whole plant but somewhat less malformation than ordinary cucumber mosaic virus. The fact, however, that it appeared to be identical in modes of transmission, properties, and host range with the latter leads the author to regard it as a strain variant of this form.

A description is also given of a cucumber mosaic virus which was obtained in the autumn of 1933 by J. C. Walker from cucumbers growing in a commercial greenhouse in Milwaukee, Wisconsin, and which when inoculated into tobacco and other common hosts produced a milder type of symptoms than the ordinary cucumber mosaic, and also differed from the latter in its somewhat lower thermal death point and its lesser tolerance to dilution and longevity *in vitro*. In spite of these differences this virus, which is termed 'cucumber mild mosaic virus', is considered also to belong to the same general group of cucumber mosaics.

SALZMANN-DANIN (Mme Z.) & DE BONIS (E.). **Sulla deficienza di clorofilla in alcuni Tabacchi ed in particolare nel Burley.** [On the lack of chlorophyll in certain Tobacco varieties, especially Burley.]—*Boll. tec. Tab.*, xxxii, 1, pp. 18–35, 8 figs., 1935. [French summary.]

The leaves of certain tobacco varieties, e.g., White Burley and various strains derived from it at the Scafati (Salerno) Experiment Station, Sarì di Fersala and Sarì di Tessalia (Greek) and their hybrids (*Nicotiana tabacum*), and Chwitzent (*N. rustica*), have been observed gradually to lose their green coloration with approaching maturity and eventually to turn practically white. Histological studies revealed no anatomical abnormality but the cell content was reduced to a minimum and the chloroplasts had almost entirely disappeared. No improvement was effected by the application to the plants of iron or magnesium solutions [cf. *R.A.M.*, x, pp. 276, 686, 761], so that the form of albinism under observation cannot be ascribed to failure to absorb these elements. There was, however, an excess of potassium over calcium and magnesium in the affected foliage which is evidently correlated in some way, not yet fully elucidated, with the bleaching phenomenon.

BORTNER (C. E.). **Toxicity of manganese to Turkish Tobacco in acid Kentucky soils.**—*Soil Sci.*, xxxix, 1, pp. 15–33, 5 pl., 1935.

In connexion with a study of frenching of Turkish tobacco in unlimed Kentucky soils [*R.A.M.*, xiii, p. 731] a chlorotic condition was observed which was experimentally proved to be due to an excess of soluble manganese in the soil. The disorder was induced in plants in

water cultures by the addition to the nutrient solution of manganese at the rate of 15 p.p.m., and an analysis of plants grown in the affected areas revealed a general correlation between the extent of injury, percentage of manganese in the plants, and amount of this element leached from the macerated stems and leaves ground with distilled water.

CALDWELL (J.). **The physiology of virus diseases in plants. VII. Experiments on the purification of the virus of yellow mosaic of Tomato.**—*Ann. appl. Biol.*, xxii, 1, pp. 68–85, 2 pl., 1935.

Continuing his investigations on the nature of the virus of the yellow mosaic of tomato [*R.A.M.*, xiii, p. 660], the author gives details of experiments on the purification of this virus, using a slight modification of Vinson's and Petre's method [ibid., x, p. 761]. The results indicated that viruliferous material always contained traces of organic nitrogen, and no evidence was obtained that the virus could be recovered in a crystalline form [cf. ibid., xiii, p. 475]. The virus was found to be active over a wide range of P_H values (2 to 10·5), but adjustments had to be made before inoculation into *Nicotiana glutinosa* leaves, since at the extremes of the scale the excessive acidity or alkalinity of the inoculum was toxic to the leaf cells. Attempts to free the virus from proteins by protein precipitants or electrolysis, and also by proteolytic enzymes, did not give satisfactory results, as difficulty was experienced in ensuring that the effect of some reagents was exerted on the virus and not on the tissues of the plants used for testing its activity.

VAN HALTERN (F.). **Control of Tomato seedbed diseases of southern plants.**—*Bull. Ga Exp. Sta.* 187, 39 pp., 1935.

From the results [which are fully discussed and tabulated] of large-scale experiments from 1931 to 1934 in the control of some important tomato diseases in Georgia, where there is an extensive cultivation of outdoor-grown plants for transplanting in the northern States such as Indiana [*R.A.M.*, xiii, p. 767], it is apparent that northern-grown seed (which is chiefly used) is the carrier and main source of the bulk of infection occurring in the southern plants. The early blight fungus (*Macrosporium* [*Alternaria*] *solani*) [ibid., xiii, p. 195], however, was found to overwinter in the soil, healthy seed planted in soil not previously used for tomatoes producing a sound crop, while another portion of the same seed in soil bearing tomatoes the year before yielded a blighted stand. In two tests bacterial canker (*Aplanobacter michiganense*) [ibid., xiv, p. 151] did not overwinter in southern Georgia. Certified seed lots in 1934 appeared to be much freer of disease than commercial seed, 42 per cent. of the plots of the former being entirely free from infection. Five minutes' immersion of the seed in 1 in 3,000 mercuric chloride is recommended, supplemented by spraying with Bordeaux mixture (2–3–50 when the second rough leaves start and 3–4–50 at fortnightly intervals for subsequent treatments) and by sanitary precautions against contamination. The experiments on which these recommendations are based are fully described.

Tubeuf [C. v.]. **Werdegang der Erforschung der sog. Ulmenkrankheit in Europa.** [The course of research on the so-called Elm disease in Europe.]—*Z. PflKrankh.*, xlv, 2, pp. 49–78; 4, pp. 161–189, 12 figs., 1935.

The course of the investigations on the dying-off of elms (*Ceratostomella ulmi*) in Europe is traced from the first mention of the disease in the Dutch literature in 1921 [*R.A.M.*, i, p. 277; xi, p. 610] to the present time. The more important papers on the subject are briefly summarized and discussed in the light of the author's personal observations and studies in the Munich district. In conclusion attention is drawn to the hitherto unexplained part played by the ubiquitous *Pseudomonas lignicola* [ibid., xii, p. 194] in the etiology of the disease.

Lüstner (G.). & Gante (T.). **Bemerkungen zum Ulmensterben.** [Observations on the dying-off of Elms.]—*Z. PflKrankh.*, xlv, 2, pp. 79–97, 1935.

A perusal of the relevant literature, supplemented by personal observations at Geisenheim (Rhine), has convinced the writers that elm trees contracting the so-called dying-off in a spasmodic or chronic form possess some inherent natural tendency or predisposition to infection by the causal organism (*Ceratostomella ulmi*) [see preceding abstract]. Such a character may be conditioned either by native varietal susceptibility or by adverse external conditions, especially drought. In this connexion mention is made of the uniformly excellent health and vigour of a group of elms situated beside a stream near Geisenheim, in contrast to the diseased state of others in drier sites. The theory that *C. ulmi* is a facultative parasite, requiring enfeeblement of the host to effect penetration, is said to have been confirmed by the results of inoculation experiments in Holland [*R.A.M.*, xiii, p. 549], Berlin-Dahlem [ibid., xi, p. 274], and Geisenheim, in which the symptoms thus artificially induced had completely disappeared a year after the trials.

Kalandra (A.) & Pfeffer (A.). **Ein Beitrag zum Studium der Ulmengraphiose.** [A contribution to the study of Elm graphiosis.]—Reprinted from *Lesn. Práce*, xiv, 17 pp., 4 pl., 1935. [Czech, with German summary. Abs. in *Rev. appl. Ent.*, Ser. A, xxiii, 5, p. 228, 1935.]

Dutch elm disease (*Ceratostomella ulmi*) is stated to have been first observed in Czecho-Slovakia [*R.A.M.*, xiv, p. 264] in 1931 in the province of Bohemia, whence it spread to other parts of the country. The species affected are *Ulmus campestris*, *U. effusa*, and to a lesser extent *U. montana*. The fungus is readily transmitted by Scolytids (chiefly *Scolytus multistriatus*, *S. scolytus*, and *S. pygmaeus*), both larvae and adults of which harbour it in their digestive organs, the latter also bearing it externally. Favourable conditions for bark beetles were created by the weakening of elms consequent on the severe winter of 1928–9, a decline in the abundance of birds, and the accumulation in forests of large numbers of felled, unbarked trees. All infested trees, even those only slightly attacked by beetles, should be cut down and barked or submerged for several weeks in water to destroy the larvae

and pupae [cf. ibid., xiii, p. 352]. In Bulgaria, where elms killed by *C. ulmi* were found in 1934 [ibid., xii, p. 252; xiv, p. 264], *S. sulcifrons* and *S. affinis* are also involved in the transmission of the fungus.

WORTHLEY (L. H.). **The Dutch Elm disease eradication project: Federal, State, and local co-operation.**—*Circ. U.S. Dep. Agric.* 353, 4 pp., 1935.

In this paper, designed primarily for landowners and for municipal and county officials concerned with the care of shade trees, the writer briefly outlines the various ways in which the public can assist the Governmental agencies in the control of Dutch elm disease (*Graphium* [*Ceratostomella*] *ulmi*) in the United States [*R.A.M.*, xiv, p. 406]. These include location of diseased elms, collection of elm insects, sanitation work and care of the elms. Plans are being made for systematic scouting of the area within 50 or 60 miles of New York City and other areas known or suspected to be liable to infection. Suspected cases will be examined in the field and confirmed at the laboratory. The list of all verified cases is submitted to the proper State official for arrangement with the owner for eradication and burning. A concerted effort is being made to remove all dead or dying elm trees and cut and fallen elm wood in or near the main infected area as liable to support the insect carriers and possibly the fungus. Standing elms should be kept in as good condition as possible as the bark insects prefer trees of low vitality [see preceding abstracts].

CARTER (J. C.). **Cytosporina canker on American Elm in Illinois nurseries.**—*Plant Dis. Reptr*, xix, 2, pp. 14–16, 1935. [Mimeographed.]

Among the fungi isolated from diseased elms by members of the Illinois State Natural History Staff since 1930, species of *Coniothyrium* and *Phoma* are stated to account for 27·5 and 13·2 per cent., respectively, of the total obtained during the four-year period under review [*R.A.M.*, xii, p. 124]. In July, 1934, a *Cytosporina*, provisionally identified as *C. ludibunda* [ibid., xiv, p. 453], was found fruiting on diseased American elms [*Ulmus americana*], this being only the second record of its occurrence on the same host in the State. The fungus is not listed by Seymour in his 'Host Index' on elm in North America, while Saccardo ('Sylloge Fungorum') gives *Ulmus* as a host but does not include North America in its range. *C. ludibunda* was estimated to be responsible for 24·76 per cent. of the total number of elm cankers in three plots examined in 1934, compared with 13·34 per cent. for *Phoma* and 61·90 per cent. of undetermined origin.

COLE (J. R.). **Gnomonia nerviseda, the perfect stage of the fungus that causes the vein spot of Pecan foliage.**—*J. agric. Res.*, l, 1, pp. 91–96, 2 figs., 1935.

A Latin diagnosis and English description are given of *Gnomonia nerviseda* n. comb. which cultural studies and pathogenicity tests showed to be the perfect stage of *Leptothyrium nervisedum*, the cause of the vein spot disease of pecan (*Carya pecan*) in the United States [*R.A.M.*, xii, p. 798]. The fungus differs morphologically from other

species on the same host, namely, *G. setacea* (Pers.) Ces. & de Not. var. *macrospora* E. & E. and *G. caryae* var. *pecanae* [ibid., xiii, p. 410], and is characterized by mostly hypophyllous, ellipsoidal, single or gregarious perithecia, 250 to 275 by 160 to 185 μ in diameter, with beaks measuring 200 to 300 by 75 to 100 μ. The asci are thin-walled, hyaline, cylindrical, 36 to 42 by 8 μ, with a pore at the apical end, and contain eight curved uniseptate ascospores, constricted at the septum, 14 to 15 by 4 to 5 μ in diameter, and with gelatinous appendages at each end. Paraphyses are not present.

In nature the pycnidial stage of the vein spot fungus does not develop until summer or early autumn, while the ascogenous stage appears the following spring on old vein spot lesions on fallen leaves.

Smith (C. L.), Alben (A. O.), & Cole (J. R.). **Progress report of Pecan roset control experiments in Texas.**—*Proc. Tex. Pecan Grs' Ass. 1934*, pp. 41–46 [?1934. Abs. in *Chem. Abstr.*, xxix, 11, p. 3764, 1935.]

Pecan [*Carya pecan*] rosette was controlled in the latest of the continuous series of experiments proceeding in Texas [*R.A.M.*, xii, p. 339; cf. also xiii, p. 812] by three to four applications of zinc sulphate at the rate of 1 lb. in 50 galls. water. The application to the ground of the same preparation was less satisfactory, especially in the case of calcareous soils. Promising results were obtained by injecting dry zinc sulphate, at the rate of 15 to 45 gm. per sq. ft. of cross-section area of the tree trunk, through holes about 2·5 in. deep spaced in a spiral round the tree at horizontal distances of 3 to 6 in.

Varadaraja Iyengar (A. V.). **Deamination in virus-infected plants.**—*Nature, Lond.*, cxxxv, 3409, p. 345, 1935.

A distinct increase in hydroxy acid (especially malic) formation was observed to be a feature of the tissues in the early stages of sandal (*Santalum album*) spike [*R.A.M.*, xiv, p. 477] in south India. At a more advanced phase succinic acid was found to be present in the diseased tissues but entirely absent from healthy ones. The presence in the infected plants of an active deaminase being suggested by these phenomena, Kisch's method (*Fermentforsch.*, xiii, p. 433, 1932) was used for a series of quantitative studies, the results of which showed that the amounts of ammonia and carbon dioxide (in c.c. *N*/50) produced by 1 gm. of spiked leaf powder in 14 hours were 9·2 and 16·8 respectively, the corresponding figures for the same quantity of healthy leaf powder being 1·2 and 5·1, respectively. It is apparent from these data that the increased production of ammonia in spiked tissues is due to greater oxidative deamination.

Varadaraja Iyengar (A. V.) & Rangaswami (S.). **Studies in the control of spike disease. Part I. The role of infection centre and Lantana in the spread of disease. Part II. Use of plant poisons in controlling the spread of infection.**—*Indian For.*, lxi, 1, pp. 25–34; 2, pp. 103–111, 1 diag., 1 map, 1935.

In the North Salem Division of the Madras Presidency the number of sandal [*Santalum album*] trees affected by spike disease [see preceding

and next abstracts] was found in 1932–3 to have risen to 54,799 from 15,219 in 1917, and it is estimated that the death-rate from spike is more than ten times that due to other causes. The usual method of checking spread is to eradicate the diseased trees and burn them after rough-cleaning for the valuable scented heartwood. This is effective when executed immediately upon the detection of spike. Where the disease has been allowed to flourish unchecked it is stated to be scarcely possible to obtain a tree with a girth of 15 in. and upwards, and in one locality where 45 trees on an average yielded 1 ton of heartwood in 1922–3, it was necessary to uproot 332 in 1929–30 to make up the same quantity. The invasion of the sandal areas by *Lantana* [*camara*], a host very liable to induce spike in sandal [*R.A.M.*, xii, p. 129], is increasing; in four areas of the North Salem Division the acreage under *L. camara* increased from nil, 45, 1,472, and 2,005 in 1917 to 20,844, 37,524, 45,806, and 35,090 respectively, in 1931.

Various chemicals have been tested for their value in eradicating spiked trees, in comparison with the patented arsenical Atlas tree-killer, by injection through holes, girdling and smearing, or incision. Potassium and sodium chlorates were moderately effective but rather slow in action. Of 60 trees treated with Atlas and water (1 : 1) 14 were dead in three weeks and all in four months. The efficacy of this preparation is influenced by seasonal conditions, being reduced during the monsoon. Among the pure salts of arsenic tested [ibid., xiv, p. 477] potassium arsenite (2½ lb. per gall.) was the most effective, killing 7 out of 15 trees in three weeks and all in four months. Somewhat less satisfactory results were given by sodium arsenite. Of the other preparations tried the most efficient were arsenic chloride in dilute hydrochloric acid and arsenic oxide in caustic soda. The latter at a strength of 4 lb. As_2O_3 and 1 lb. NaOH per gallon water has been used on a large scale in the forests of North Salem and Coorg with promising results.

Venkata Rao (M. G.). **The role of undergrowth in the spread of the spike disease of Sandal.**—*Indian For.*, lxi, 3, pp. 169–188, 1935.

After discussing the distribution of sandal spike in South India [see preceding abstracts] and its relation to the associated undergrowth [*R.A.M.*, xiv, p. 265], the author states that spike-like diseases have been observed in *Zizyphus oenoplia*, *Dodonaea viscosa* [ibid., x, p. 495], *Stachytarpheta indica*, and *Vinca rosea*, but attempts at transmission by haustorial union [ibid., xiv, p. 204] have failed. By actually growing sandal from seed in infected areas, even plants of only nine months old and 1 ft. 3 in. in height contracted spike in the open, indicating that the minimum incubation period of the disease in nature is less than nine months. Spike has not been found, however, on young plants growing under bushes, suggesting that shade probably renders them more tolerant of the virus and also masks the symptoms. Tests on potted sandal plants in a heavily infected area have shown that the disease also travels above ground and insects are strongly suspected to be concerned in this aerial form of transmission. Negative results were given by all attempts to transmit infection through pollen and seed from partially spiked trees.

Jelutong. **Damage by insects and fungi.**—*Malay. Forester*, iii, 3, pp. 133–137, 1934.

Jelutong [*Dyera costulata*] timber, when carelessly stacked or left lying about in the jungle, is stated to be very liable to attack by a species of *Diplodium* [*?Diplodia*], causing a rapidly spreading greyish discoloration or blue stain. Infected planks may become permeated by the hyphae in a few days, as was shown by an experiment under conditions approximating to those obtaining in ill-ventilated stacks. Laboratory tests indicate that the fungus may reduce the strength of the timber by as much as 10 per cent., but this form of deterioration is relatively unimportant compared with the devaluation resulting from discoloration of the wood. A species of *Irpex* has been found to be responsible for a reddish stain in the early stages of decay.

Diller (J. D.). **The Atropellis canker of eastern Pines.**—*Plant Dis. Reptr*, xix, 2, p. 17, 1935. [Mimeographed.]

In 1932 a canker of pines (mostly Scotch [*Pinus sylvestris*]) was investigated in the Shawnee State Forest, Ohio. The disease appeared to be closely related to, but not identical with, that described on western white pine [*P. monticola*] from the Pacific North-west by Zeller and Goodding as due to *Atropellis pinicola* [*R.A.M.*, xiii, p. 685]. The disorder is stated to be widely distributed from the New England and Lake States to the Gulf States, and from the Atlantic coast to eastern Texas and Oklahoma. The evidence regarding the origin of the fungus is conflicting. Its development on so many native and exotic pines in the eastern States, together with the detection of old cankers throughout practically the whole range of the disease point to a native origin, but on the other hand, its rapid increase of recent years on certain American species in some localities rather denotes that a foreign introduction of several decades' standing is now assuming an epidemic form. For instance, in a nine-year-old slash pine [*P. caribaea*] stand 87 per cent. of the trees were infected and 29 per cent. of the branches were killed by the disease.

Finlayson (E. H.). **Report of the Director of Forestry 1933–4 (fiscal year ended March 31, 1934.).**—*Bull. For. Br. Can.*, 40 pp., 1934. [Received April, 1935.]

This report contains the following items of phytopathological interest in addition to those noticed from other sources. It is hoped to enlist the co-operation of the Federal and Provincial Governments and of interested industry to utilize unemployment relief labour in the work of currant and gooseberry eradication against white pine blister rust [*Cronartium ribicola*], an operation effectively performed in the eastern United States at a rough cost of 25 cents per acre [*R.A.M.*, xiii, p. 666]. It is estimated that the 11 billion board feet of white pine, of which 9·3 billion are of eastern [*Pinus strobus*] and 1·7 billion of western [*P. monticola*: ibid., xiv, p. 135], in Canada represent a value of $55,000,000.

Notes are given on the wood preservation experiments conducted with various materials, including brine from Lake Muskiki (sp. gr. 1·345),

the impregnation of Jack pine [*P. banksiana*] sapwood with which effectively checked the growth of *Coniophora cerebella* [*C. puteana*].

Tubeuf [C. v.]. **Wo stehen wir mit der Erforschung des Blasenrostes der Weymouthskiefer?** [Where do we stand in the research on blister rust of the Weymouth Pine?]—*Z. PflKrankh.*, xlv, 4, pp. 190–210, 1 fig., 1935.

The writer's previous appeals for the control of *Cronartium ribicola* on white pine (*Pinus strobus*) in Germany [*R.A.M.*, xiii, p. 136] are recapitulated. Where the trees are actually diseased they must be eradicated; healthy stands may be perpetuated only by means of seed and natural regeneration. *P. peuce*, formerly believed to be immune from blister rust, can no longer be recommended as a substitute for the white pine since the discovery of its susceptibility [ibid., xi, p. 81]. The necessity for radical measures in combating the rust is strongly emphasized, all attempts to save the situation without sacrificing the existing diseased or suspected stands being condemned as totally inadequate.

Birch (T. T. C.). **A Phomopsis disease of conifers in New Zealand.**—*Bull. N.Z. For. Serv.* 7, 30 pp., 18 figs., 1935.

A full account, preceded by an introductory note by the Director of Forestry, A. D. McGavock, is given of the terminal wilt and canker produced on *Pinus radiata*, *P. muricata*, and *P. canariensis* at high elevations liable to severe unseasonable frosts in New Zealand by *Phomopsis strobi* [*R.A.M.*, xiv, p. 65], which is thought to have been probably introduced into the Dominion on American seed between 1927 and 1929 [ibid., x, p. 278].

The morphology of the fungus is discussed in relation to other species of *Phomopsis* pathogenic to conifers, and notes are given on its cultural characters on a number of standard media. The spores of the New Zealand form (in which the A-type only has been observed) are hyaline, unicellular, usually biguttulate, commonly elliptical to oblong-elliptical, sometimes irregular, measure 5 to 8·5 by 2 to 3 μ (mostly 5·2 to 6·7 by 2·5 to 3 μ), and are borne on small, irregular, generally subulate conidiophores, 4·4 to 7·5 by 1 to 2·5 μ. It is apparent from a study of the comparative dimensions of *P. strobi* and *P. pseudotsugae* [loc. cit.] that the two species are nearly related, and there is reason to believe that the New Zealand fungus may represent an intermediate strain with closer affinities to the former than to the latter.

The *Phomopsis* wilt is essentially a juvenile disease, rarely affecting trees beyond the age of ten years. There are four types of infection, of which one or other predominates according to the mode of injury preceding the attacks of the fungus (frost, snow, wounds, and the like). Pines commencing growth in the late spring, such as *Pinus ponderosa* and *P. murrayana*, are not susceptible to infection by *Phomopsis strobi*, while inoculation experiments on *Pinus radiata* in a locality free from unseasonable frosts (Palmerston North) gave negative results throughout the year. The importance of frost as a predisposing cause of infection was further proved by a test in which three-year-old trees of the same species (but not *P. ponderosa* or *P. murrayana*) succumbed to

inoculation with *Phomopsis strobi* following an hour's exposure to a temperature of 22° to 24° F.

GOLDIN (M. M.). Руководство по борьбе с домовым грибом. [Textbook on the control of house fungi.]—348 pp., over 250 figs. [including graphs and diagrams], Гос. Научн.-Техн. Издат. Строит. Инд. и Судостр. [State Scient. & Tech. Publ. Office for Construction and Shipbuilding], Moscow, 1934. [Received May, 1935.]

The chief aim of this book is to popularize among Russian building engineers and contractors all the information attained up to date concerning the morphology, biology, and control of house fungi and other timber-destroying or -staining organisms, in view of the extremely heavy and widespread damage done by them in recent years practically throughout the U.S.S.R., especially in densely populated centres. Its chief interest resides in the detailed discussion of all the factors and conditions that favour the development of the rots in houses and in stored timber, with technical recommendations for their elimination. Separate chapters deal at length with the chief preservatives for timber impregnation and methods for their application, and also with the best means for controlling the rots in infected buildings, the whole calculated to apply to working conditions prevailing in Russia at the present time.

[MOLL (F.)]. **Die Verwendung von Zinksalzen zum Holzschutz.** [The use of zinc salts for wood protection.]—*Holzmarkt, Berl.*, pp. 3–4, 27th March, 1935.

Attention is drawn to the great superiority of acid zinc fluoride and zinc fluosilicate over zinc chloride and other zinc compounds as timber preservatives. Estimated by weight, the toxic activity to wood-destroying fungi of the fluorine ion is nearly four times that of the zinc ion, and the efficacy of zinc fluoride and of zinc fluosilicate in proportion to that of zinc chloride is as 237 and.307, respectively, to 49. Fluralsil [*R.A.M.*, xi, p. 84], a zinc fluosilicate preparation of the Brand Dyeworks, is stated to be particularly effective for the general protection of mine timber and against dry rot [*Merulius lacrymans*].

CAMPBELL (W. G.). **The chemical aspect of timber research.**—*J. Soc. chem. Ind., Lond.*, liv, 14, pp. 302–306, 1 fig., 1 graph, 1935.

In connexion with a general discussion on the chemical aspect of timber research, Rudge's theory of ionic intrusion as a necessary preliminary to fungal decay [*R.A.M.*, xiii, p. 816; xiv, p. 139 and next abstract] is refuted on the basis of observations and experiments at the Forest Products Research Laboratory. It is pointed out that wood exposed to the protracted action of moderate heat bears a striking resemblance to that invaded by *Merulius lacrymans*, except for the darker colour of the latter, the same process of hydrolysis being at work in both cases.

RUDGE (E. A.). **The decay of wood.**—*J. Soc. chem. Ind., Lond.*, liv, 14, pp. 307–309, 1935.

Recapitulating his views as to the importance of ionic infiltration in the causation of timber decay [see preceding and next abstracts], the

author briefly considers the possible applications of the knowledge acquired in his investigations to the industrial aspects of timber chemistry.

CAMPBELL (W. G.), TAYLOR (K. FRIEDA), & BRYANT (S. A.). **Some observations on the action of certain calcium salts on wood with special reference to the 'inorganic infiltration' theory of decay.**—*J. Soc. chem. Ind., Lond.*, liv, 14, pp. 103T–105T, 1 diag., 1935.

Sufficient evidence is considered to be forthcoming from the writers' experiments on oak and tulip wood (*Liriodendron*) [*tulipifera*] [details of the technique and results of which are given] to show that calcium carbonate and other calcium compounds (acetate, chloride, hydroxide) in the presence of carbon dioxide are unable in the absence of decay-inducing organisms to initiate any changes that could reasonably be interpreted as incipient decay. The pleasing dark brown coloration imparted by the salts (and incidentally affording scientific proof of the efficacy of the traditional practice of liming for this purpose) cannot, in the writers' opinion, be so regarded. It is, however, quite possible that, under certain conditions, calcium salts in their diffusion through the wood react with the tannin in such a way as to counteract the inhibitory effects of the latter on fungal growth. Evidence to this effect, would, of course, lend a real significance to the process of calcium infiltration in industrial timbers.

VAN POETEREN (N.). **Over de voorschriften tot wering van plantenziekten in verschillende landen.** [On the regulations for the exclusion of plant diseases in different countries.]—*Landbouwk. Tijdschr., Wageningen*, xlvi, 571, pp. 135–139, 1935.

Attention is drawn to some anomalies in the regulations for the exclusion of plant pests and diseases in various countries and a plea advanced for their revision on a more rational and liberal basis. Exception is taken in particular to the general policy of framing the laws to suit the level of the countries with the lowest standards of scientific agriculture, and to the tendency to exaggerate the risks of introducing a pest or disease from one country to another.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, ix, 3, pp. 59–62, 1935.

AUSTRIA. Law No. 8 of 13th December, 1933, regulates the points left open by Federal Law No. 252 of 12th July, 1929, with regard to phytopathological legislation in the autonomous provinces ('Länder'). On the establishment of the presence of a disease or pest, the necessary control and disinfection measures can be prescribed by the provincial Government, which is authorized, under certain conditions, to arrange for co-operative steps to be taken by all communes and owners interested. A list of compulsorily notifiable diseases and pests will be published.

EGYPT. According to a communication addressed to the International Institute of Agriculture by the Royal Legation of Egypt, Rome, the

entrance into Egypt of the following plant diseases is prohibited [cf. *R.A.M.*, xii, p. 592]: citrus canker and blast or black pit (*Phytomonas* [*Pseudomonas*] *citri* and *P. citriputeale* [ibid., xii, p. 376], respectively); crown gall (*Bacterium tumefaciens*) of various fruits (including loquats and olives); potato wart (*Synchytrium endobioticum*) and powdery and common scab (*Spongospora subterranea* and *Actinomyces scabies*); and onion smut (*Urocystis cepulae*) [ibid., xiii, pp. 288, 743].

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, ix, 4, pp. 87–88, 1935.

Brazil. By Ministerial Resolution of 19th November, 1934, the importation from any country into the whole of Brazil of the following (among other) plants and parts thereof is prohibited [cf. *R.A.M.*, v, p. 448]: cotton seeds and bolls, banana suckers and pseudo-bulbs, coffee berries, coffee tree shoots, seeds and shoots of other Rubiaceae, cacao shoots, fruits, and seeds, sugar-cane shoots, buds, and seeds, and the seeds, bud grafts, and shoots of *Citrus*, *Poncirus*, *Fortunella*, and related Rutaceae. The restrictions on inter-State traffic in various plants are also summarized.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. NachrBl. dtsch. PflSchDienst*, vii, 4, pp. 39–42, 1935.

Denmark. The following regulations in respect of potato importation into Denmark, superseding those of 21st July, 1927 [*R.A.M.*, vii, p. 287], take effect from 1st March, 1935. Potatoes from countries in which wart disease (*Synchytrium endobioticum*) is known to have occurred during the last ten years may not be imported. Importation from other countries is permitted subject to the usual safeguards, including a statement to the effect that the consignment is free from wart disease and originated in a locality at least 5 km. distant from any place infested by the fungus during the last ten years.

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. Service and regulatory announcements October–December 1934.—pp. 105–112, 113–115, 1935.

Summaries are given of the plant quarantine import regulations in Poland [*R.A.M.*, v, p. 256] and Palestine [ibid., xiii, p. 672].

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. Modification of White Pine blister rust quarantine regulations. Amendment No. 1 to revised rules and regulations supplemental to notice of quarantine No. 63.—2 pp., 1935.

As from 15th March, 1935, Minnesota is included in the list of States (now 10) for which special control-area permits, issued by the local representative of the Bureau of Entomology and Plant Quarantine, are necessary for the importation of currant or gooseberry bushes of any species or variety into districts outside the legally established blister rust [*Cronartium ribicola*] control area [*R.A.M.*, xii, p. 400].